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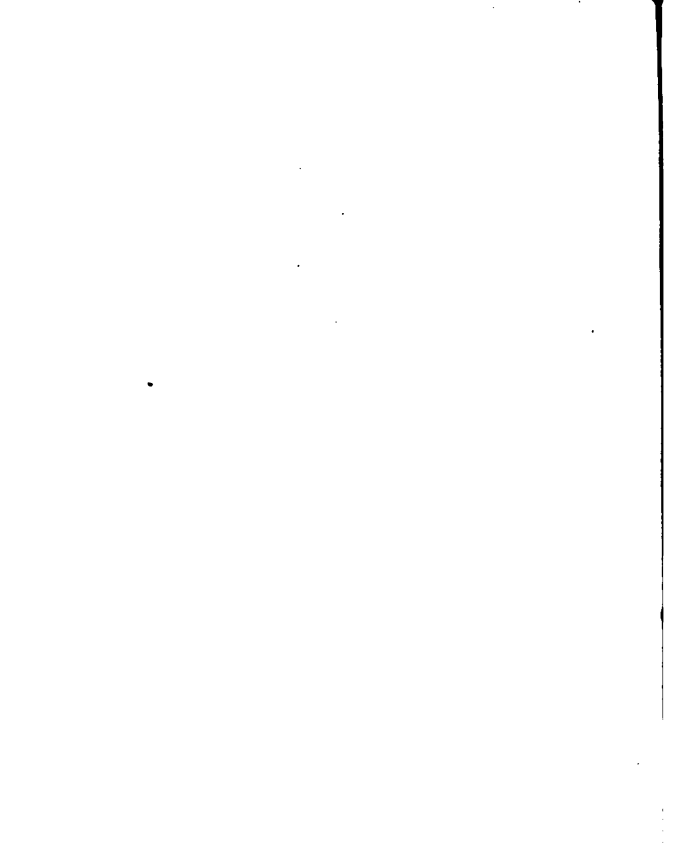
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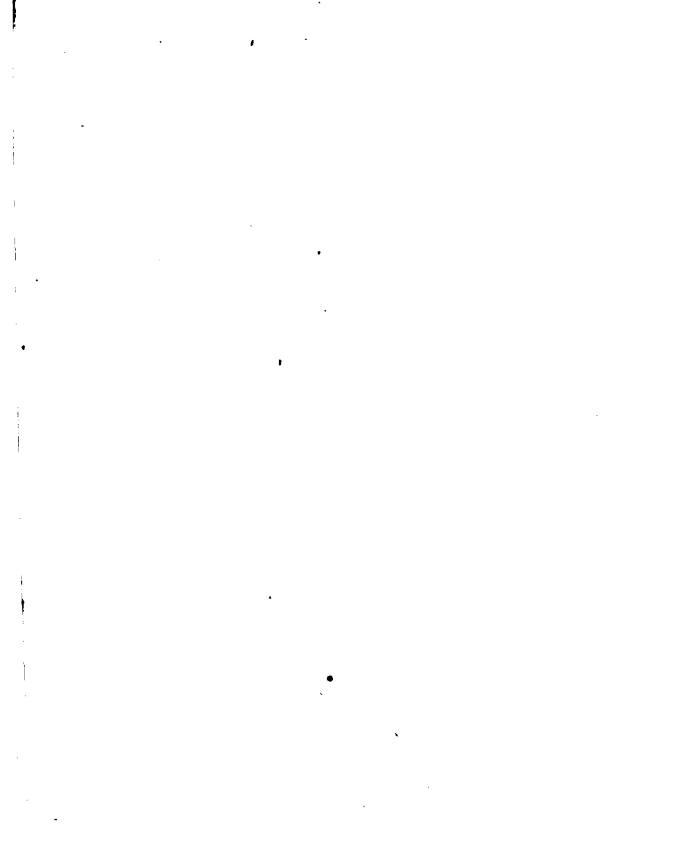


Fig. 1.

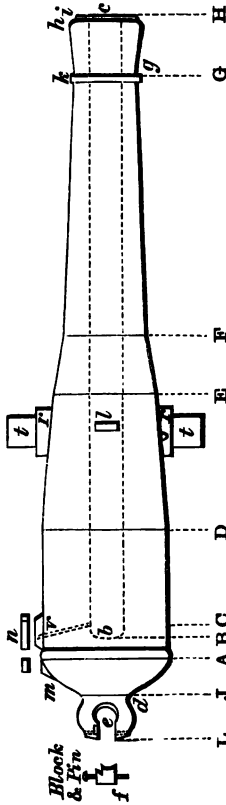


Fig. 2.



Fig. 3.



SHELL GUNS.

Fig. 2. Cylindrical Chamber.

ba, Chamber.

ea, Slope.

Fig. 3. ba, Gomer Chamber.

Fig. 1.

AJ. Base of breech.
d. Neck.
e. Jaws.
f. Block and pin

AL. Cas-
cabel.

AB. Breech.

AC. Curve of base-ring.

BD. 1st Reinforce.

DE. 2d do.

EF. Curve of Reinforce.

FG. Chase.

AH. Length of Gun.

GH. Muzzle.

E. Neck.

h. Swell.

i. Lip and fillet.

c. Face.

tt. Trunnions.

rt. Rimbases.

l. Reinforce-right mass.

m. Breech-sight mass.

n. Lock-piece.

v. Vent.

bc. Length of bore.

b. Bottom of bore.

k. Chase ring.



MANUAL

OF

GUNNERY INSTRUCTIONS

FOR THE

NAVY OF THE UNITED STATES.

COMPILED FROM THE

ORDNANCE INSTRUCTIONS FOR THE U. S. NAVY,

FOR THE USE OF

THE UNITED STATES' NAVAL ACADEMY.

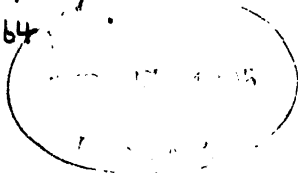
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CHAPTER I.

GENERAL DISTRIBUTION OF OFFICERS AND MEN AT QUARTERS.

1. THE following directions for the general distribution of a ship's company at quarters, or for action, are intended to secure, upon the most important points, a degree of uniformity which will promote efficiency, and at the same time leave to the Captains the selection and arrangement of many individuals under their command, according to their own views of the particular qualifications of each.

2. The CAPTAIN's station, in action, is upon the quarter deck.

3. The Executive Officer; the Midshipmen acting as *aids* to the Captain; and the Signal Officer, are also to be stationed on the quarter deck.

4. The stations of the other Officers are to be regulated by divisions, as follows:

The guns upon each deck are to be numbered from *forward*, beginning with No. 1, and continuing aft in succession, each gun and its opposite being designated by the same number, excepting pivot and shifting guns, each of which is to have a separate number. The guns

on each deck are then to be divided as equally as possible into three or two divisions, according to the number of Lieutenants or other Watch Officers on board, so that each division of guns, and the persons belonging to it, may be commanded by a Lieutenant or other Watch Officer. These divisions are to be numbered consecutively, designating the forward division on the lowest gun deck as the first division, and passing from the after division of one deck to the forward division of the next deck above it.

5. The command of these divisions of guns is to be assigned, in the order of their numbers, to the Lieutenants or other Watch Officers, according to their rank, assigning the first division to the officer next in rank to the Executive Officer. In case of a deficiency of Watch Officers, the quarter deck division may be assigned to an Ensign or Midshipman, who will act under the general supervision of the Executive Officer. When the number of officers on board of vessels having pivot guns will permit, each pivot gun will be placed under the special charge of a suitable officer of the division of which it forms a part.

Master's Division.

6. This division will comprise all those stationed in the tops, and those appointed to attend to the rigging, sails, steerage and signals. The Master is to be stationed on the quarter deck, and to be assisted by the Boatswain.

whose station will be on the fore-castle. The Boatswain will be charged with all his divisional duties in the event of his death or absence. (*For arms, see table in article 38.*)

Powder Division.

7. This division will be under the direction either of a Lieutenant, Master, Ensign, or competent Midshipman. It will consist of all those stationed below the gun decks, except persons belonging to the Surgeon's Division and the Paymaster and his Clerk.

The Gunner is to be stationed in the main magazine, and a Gunner's Mate or Quarter Gunner in the other magazine, when there are two; and those persons of this division who may be stationed in the magazines and passages are to be under the immediate direction of the Gunner and his Mate, respectively. Those of the Carpenter's crew stationed in the hold or wings are to be under the immediate direction of the Carpenter's Mate, who will be stationed with them. All reports, however, are to be made through the Commanding Officer of the division.

Division of Marines.

8. All the Marines who may not be distributed to other divisions for action are to compose a Division of Marines, to be under the immediate command of the Superior or Senior Officer of Marines on board. He will

form his division on such part or parts of the spar or upper deck as the Captain may direct.

Surgeon's Division.

9. The SURGEON, or senior Medical Officer, will have the direction of this division, which shall comprise all the Medical Officers and such other persons as may be designated by the Captain to assist in the care of the wounded in action. This division will occupy the cockpit or such other convenient place as the Captain of the vessel may direct.

The Chaplain.

10. The CHAPLAIN will be in attendance to perform the duties of his sacred office, and to render such other service as may be in his power.

Paymaster.

11. The PAYMASTER's station will be in the ward room and on the berth desk, in charge of the money, books, and stores belonging to his department.

Engineer Division.

12. The Engineer Division shall be under the direction of the Chief Engineer, and shall comprise the Assistant Engineers and such of the Firemen and Coalheavers as may be detailed for the purpose. An Assistant will be appointed to take charge of the fire party detailed from this Division.

13. Ensigns, Midshipmen, Master's Mates, Captain's and other Clerks, the Sailmaker, and other officers not enumerated, are to be assigned to the different divisions at the discretion of the Captain.

14. In distributing the Petty Officers, Seamen and others to the guns and other stations in the several divisions, it is desirable, as a general rule, that those stationed at the same gun or near each other at quarters, should be drawn from different stations for working ship; so that a great loss at any one gun may not fall too heavily on any watch station.

Exceptions to this general rule may be advantageously made where the duties of men require their habitual attendance on particular decks. In such cases it will generally be advisable to station them at quarters near to the places of their ordinary duties.

15. Table showing the number of men for the service of each kind and class of gun in use in the Navy, assuming the vessel to have the established complement.

| Pivot Guns. | | | | | BROADSIDE GUNS. | | | | | | | |
|--|-----------------------|---|----------------|----------------|-----------------------|----------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--|
| | | | | | Shell Guns. | | | Shot Guns. | | | | |
| XI-inch of 16,000 lbs., 150-pdr. rifle. | X-inch of 12,000 lbs. | IX-inch of 9,000 lbs., 64-pdr. of 106 cwt., 100-pdr. rifle. | 80-pdr. rifle. | 20-pdr. rifle. | IX-inch of 9,000 lbs. | VIII-inch of 63 cwt. | VIII-inch of 56 cwt. | 82-pdr. of 57 cwt. | 82-pdr. of 42 cwt. | 32-pdr. of 33 cwt. | 32-pdr. of 27 cwt. | |
| 24 | 20 | 16 | 10 | 8 | 16 | 14 | 12 | 12 | 10 | 8 | 6 | |

To the XI, X, and IX-inch, 150-pounder and 100-pounder rifle, and 64-pounder pivot guns, a Powderman, and to all other guns a Powderboy is to be added.

The number of men to form crews of guns mounted on carriages of special character, is to be regulated as may be found most advantageous by the Commanding Officer.

16. In designing the Petty Officers and others for particular stations, it is assumed that the intelligence, skill, and force of the men have been equally divided between the two watches, and that the men in the starboard watch have all odd numbers, as 1, 3, 5, &c., and those of the port watch even numbers, as 2, 4, 6, &c.

To preserve this equality and to secure the ability of those who may be upon deck to prepare the ship for action at night, whilst the watch below are bringing up and stowing the hammocks, all the *odd* numbered guns will be *entirely manned* by men belonging to the starboard watch, and all the *even* numbered guns by those belonging to the port watch, as far as practicable. The crews of pivot guns to be taken half from each watch.

17. Where ports on opposite sides of the same deck are numbered the same, and are both provided with a gun, gun's crews are only to be furnished for the guns on one side. Pivot and shifting guns are each to have full gun's crews.

18. When the complements allowed to vessels of the Navy will permit, it is recommended as a general ar-

rangement that the gun's crews be formed of about one-third Petty Officers and Seamen, one-third Ordinary Seamen, and one-third Landsmen and Boys, and that this system be observed as nearly as practicable.

19. At least one Quarter Gunner should be stationed at each division of guns ; and a Gunner's Mate or Quarter Gunner in the smaller magazine, and in each shell room.

If there be more shell rooms than there are disposable Quarter Gunners to attend them, other careful and suitable persons are to be selected to supply the deficiency.

20. Forms of Quarter Bills for different classes of vessels, arranged upon this plan and with reference to stations in watches, and to arrangements for passing powder, are placed in the Appendix.

Though it is not proposed to require an exclusive adherence to these forms, yet their adoption, where practicable, and the application of the same principle to all vessels, is strongly recommended, that as near an approach to uniformity may be secured as circumstances will permit.

21. Before permanently assigning the individuals which form a gun's crew, to the performance of particular duties connected with its service in action, it is important to ascertain their respective qualifications, as far as may be practicable, by questioning them or by exercising them at the guns.

The Captains, especially, should be selected from those in whose skill, coolness, and judgment the greatest reli-

ance can be placed, without regard to their ratings, though at the same time care should be taken to avoid stationing men of a higher rating than the Captains of the guns, to perform subordinate duties at the same guns. They should be examined by the Surgeon with reference to eyesight.

Spongers and Loaders rank next in importance, and with activity and coolness should possess the necessary physical strength and stature. For Handspikemen, weight is important in addition to strength and coolness.

22. Very careful men should be selected for attending the Powder-scuttles on the different decks, as well to prevent noise and contention among the Powderboys as to guard against accidents and speedily to repair such as may occur. The boys should be trained to fall into line to insure an equal distribution of powder.

23. Unless some special reason should require a different arrangement with regard to Boarders, Pikemen, Firemen, Sailtrimmers, and Pumpmen, the following will be observed:

Boarders.

24. Half the men composing a gun's crew (excluding the Powderman or Boy) are to be Boarders. When this rule gives an odd number of men, the odd one is to be a Second Boarder.

25. The Boarders are to constitute two divisions, called First and Second Boarders.

26. First Boarders are, generally, to be taken from the second part of a gun's crew ; and Second Boarders from the first part.

27. All Petty Officers on the spar deck, except the Quartermaster at the conn and the Quartermaster at the wheel, are to be First Boarders.—(*For arms of Boarders, see Table, article 38.*)

The Executive Officer leads the Boarders. All the Division Officers on the spar deck shall be First Boarders, except the officer commanding the quarter-deck division, who shall lead the Pikemen. On gun-decks the officer commanding the second division shall be a First Boarder ; the commanding officers of the other divisions shall be Second Boarders. If there are two officers in any division, the second shall lead those Boarders which do not go with his principal. A Lieutenant or other responsible officer should be detailed to command the gun-deck in the absence of the boarders and pikemen.

Pikemen.

28. One-fourth of the number of men composing a gun's crew, (rejecting fractions, and excepting the Powderman or Boy,) and all the men of the Master's division on the spar deck, except those designated as Boarders, and those at the wheel and conn, are to be Pikemen, and are to compose but one division.

29. For each Pikeman at a gun there is to be a musket provided, which in action, when not in use, is to be

kept with the bayonet unfixed, hooked securely against a carline or beam near the gun; or in case of a spar deck conveniently at hand. When they are called away, they will repair on deck with these muskets, when, if ordered to do so, they will place them in a secure place, to be designated by the Executive Officer, and arm themselves with pikes. Pikemen will wear a musket cartridge-box whenever at general quarters or in action.

Pikemen of the spar deck divisions will, on being called away, arm themselves as directed.

Should it become necessary, *in an emergency*, to call "*all hands*" from below to repel an enemy, the Pikemen will, if not already so armed, arm themselves with these muskets, leaving their pikes to be used by those whose arms are not designated—that is, by the remainder of the gun's crew and Powder division.

30. One boarding pike for each gun on covered decks is always to be kept triced up conveniently near it, and this is to be used by the Powder-man, or any other person left at the gun to guard the port.

31. Pikemen are to be covered by the Marines with their bayonets fixed.

Firemen.

32. With broadside guns, one Fireman is to be taken from each gun's crew, and from pivot guns two. Each Fireman is to have a fire-bucket at hand near his gun, and to wear his battle-axe in a belt around his waist.

Sailtrimmers.

33. In *all* vessels there will be two divisions of Sailtrimmers, composed of all the men at the spar-deck guns, except 1st Captains, 1st Spongers, 1st Loaders, and Powderboys. The 1st Sailtrimmers are to be taken from the guns on the forward half, and the 2d Sailtrimmers from those on the after half of the spar deck.

34. In vessels carrying guns on more than one deck, there are to be three divisions of Sailtrimmers, called 1st, 2d, and 3d Sailtrimmers, and the third division is to be made up of one man from each gun's crew on the other deck or decks, as designated in the tables.—(*Article 38.*)

This third division of Sailtrimmers is to be regarded as a reserved force, and is not to repair on deck at the *general call* for Sailtrimmers, nor except when specially ordered. Besides serving to reinforce the other two divisions when absolutely necessary, it is also to serve to reinforce either the Firemen or the Pumpmen in cases of need.

35. The third division of Sailtrimmers, and all the Pikemen of the gun's crews, and others armed with muskets, (see *Tables, article 38,*) may be made to assemble together as a body of Musketeers, either for landing or otherwise. No one gun more than another will be weakened by so doing; and this suggests the propriety of preferring these men ordinarily for the crews of boats

Pumpmen.

36. Each gun's crew composed of as many as 14 men is to furnish two, but when of less than 14 men, one Pumpman only.

37. When Pumpmen are sufficiently numerous to admit of working the pumps well with one-half their force, they should compose two divisions, to be called 1st and 2d Pumpmen.

Distribution and Arms of Men at the Guns.

38. The annexed tables show the stations of guns' crews at pivot guns, and at broadside guns, when composed, respectively, of the following number of men: 24, 16, 14, 12, 10, 8, or 6; how each man of a gun's crew is to be armed, and the number of small arms of all kinds required for each gun's crew.

N. B.—To these tables is annexed another, showing the small arms of the master's division.

PIVOT GUN'S CREW COMPOSED OF 24 MEN AND A POWDERMAN.

| Titles of gun's crew on left side of gun. | Gun Nos. | Titles of gun's crew on right side of gun. | ARMS. | | | | | | Mus. kets. | Bottle- axes. |
|--|----------|---|---------|-----------------|---------|-------|-------|-------|---------------|------------------|
| | | | Swords. | Revol- vers. | Pistol. | Pike. | | | | |
| 1st loader, 2 B..... | 3 | ..... | 1 | 1 | ..... | ..... | ..... | ..... | ..... | ..... |
| 2d loader, 1 B..... | 5 | ..... | 1 | 1 | ..... | ..... | ..... | ..... | ..... | ..... |
| 1st shellman and pump.... | 7 | ..... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... |
| 1st front lever, 2 B..... | 9 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 1 | ..... |
| 1st compressor and pike... | 13 | ..... | 1 | 1 | 1 | ..... | ..... | ..... | 1 | ..... |
| 1st rear level and pike.... | 11 | ..... | ..... | ..... | ..... | 1 | ..... | ..... | 1 | ..... |
| Tr. tackle, deck block, 2 B. | 17 | ..... | ..... | 1 | ..... | 1 | ..... | ..... | 1 | ..... |
| Tr. tackle, slide block, 2 B. | 19 | ..... | 1 | 1 | 1 | ..... | ..... | ..... | ..... | ..... |
| Shifting tackle, deck block, and pikeman..... | 21 | ..... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... |
| Shifting tackle, slide block. | 23 | ..... | ..... | ..... | ..... | 1 | ..... | ..... | 1 | ..... |
| 1st train lever and fireman. | 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 | ..... |
| 1st captain, 2 B..... | 1 | ..... | 1 | 1 | ..... | ..... | ..... | ..... | 1 | ..... |
| Powderman..... | 25 | ..... | 1 | 1 | ..... | ..... | ..... | ..... | ..... | ..... |
| Total number of arms..... | ..... | ..... | 12 | 7 | 5 | 6 | 8 | ..... | ..... | 6 |

GUN'S CREW COMPOSED OF 16 MEN AND A POWDERMAN.

| Titles of gun's crew on left side of gun. | | Gun Nos. | Titles of gun's crew on right side of gun. | | | | | | ARMS. | | | | | | |
|--|--|-------------|---|---|---|---|---|--------------------------------|-------|----|----|----|---|---|--|
| | | | | | | | | | | | | | | | |
| | | | 4 | 8 | 6 | 8 | 7 | 14 | 18 | 15 | 11 | 10 | 9 | 1 | |
| 1st loader, 2 B..... | | 3 | | | | | | 1st sponger, 2 B..... | | | | | | | |
| 2d loader, 1 B..... | | 5 | | | | | | 2d sponger, 1 B..... | | | | | | | |
| 1st shellman, 2d pump.... | | | | | | | | 2d shellman and 1st pump. | | | | | | | |
| 1st side tackle. and pike... | | | | | | | | 2d side tackle. and pike | | | | | | | |
| 1st port tackle. and pike... | | | | | | | | 2d port tackle. and pike | | | | | | | |
| 1st train tackle. and fire... | | | | | | | | 2d train tackle. and sailtrim. | | | | | | | |
| 1st handspike, 2 B..... | | | | | | | | 2d handspike, 1 B..... | | | | | | | |
| 1st captain. 2 B..... | | | | | | | | 2d captain, 1 B..... | | | | | | | |
| Powderman..... | | | | | | | | | | | | | | | |
| Total number of arms.. | | | | | | | | | | | | | | | |
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N. B.—On other than lower decks, for Port-tacklemen substitute 8d and 4th Side-tacklemen.

GUN'S CREW COMPOSED OF 14 MEN AND A POWDERBOY.

| Titles of gun's crew on left side of gun. | Gun Nos. | Titles of gun's crew on right side of gun. | ARMS. | | | | | |
|--|-------------|---|---------|------------|----------|--------|----------|--------------|
| | | | Swords. | Revolvers. | Pistols. | Pikes. | Muskets. | Battle-axes. |
| 1st loader, 2 B..... | 3 | 4 1st sponger, 2 B..... | 1 | 1 | ..... | ..... | ..... | ..... |
| 2d loader, 1 B..... | 5 | 6 2d sponger, 1 B..... | 1 | 1 | 1 | ..... | ..... | ..... |
| 1st shellman and 2d pump. | 7 | 8 2d shellman and 1st pump. | 1 | ..... | ..... | ..... | ..... | 1 |
| 1st side tackle, and pike... | 13 | 14 2d side tackle, and pike... | ..... | ..... | ..... | 1 | 1 | ..... |
| 1st train tackle, and fire... | 11 | 12 2d train tackle, and sailtrim | ..... | ..... | ..... | 1 | 1 | ..... |
| 1st handspike, 2 B..... | 9 | 10 2d handspike and pike... | ..... | ..... | ..... | 1 | 1 | ..... |
| 1st captain, 2 B..... | 1 | 2d captain, 1 B..... | 1 | 1 | 1 | ..... | ..... | ..... |
| Powderboy..... | ... | ..... | 1 | 1 | ..... | ..... | ..... | ..... |
| Total number of arms... | .... | ..... | 7 | 4 | 3 | 3 | 4 | 4 |

GUN'S CREW COMPOSED OF 12 MEN AND A POWDERBOY.

| Titles of gun's crew on left side of gun. | Gun Nos. | Titles of gun's crew on right side of gun. | ARMS. | | | | | |
|--|-------------|---|---------|------------|----------|--------|----------|--------------|
| | | | Swords. | Revolvers. | Pistols. | Pikes. | Muskets. | Battle-axes. |
| 1st loader, 2 B..... | 3 | 4 1st sponger, 2 B..... | 1 | 1 | 1 | ..... | ..... | ..... |
| 2d loader, 1 B..... | 5 | 2d sponger, 1 B..... | 1 | 1 | 1 | ..... | ..... | ..... |
| 1st shotman and pike..... | 7 | 2d shotman and pump..... | 1 | ..... | ..... | 1 | 1 | 1 |
| 1st train tackle. and fire... | 11 | 2d train tackle. and salitrim | ..... | ..... | ..... | 1 | 1 | 1 |
| 1st handspike. and pike.... | 9 | 2d handspike. and pike..... | ..... | ..... | ..... | 1 | 1 | ..... |
| 1st captain, 2 B..... | 1 | 2d captain, 1 B..... | 1 | 1 | ..... | ..... | ..... | ..... |
| Powderboy..... | ..... | ..... | 1 | 1 | ..... | ..... | ..... | ..... |
| Total number of arms.... | ..... | ..... | 6 | 3 | 3 | 3 | 4 | 3 |

GUN'S CREW COMPOSED OF 10 MEN AND A POWDERBOY.

| Titles of gun's crew on left side of gun. | Gun Nos. | Titles of gun's crew on right side of gun. | ARMS. | | | | | |
|--|-------------|---|---------|------------|----------|--------|----------|--------------|
| | | | Swords. | Revolvers. | Pistols. | Pikes. | Muskets. | Battle-axes. |
| 1st loader, 2 B..... | 8 | 4 1st sponger, 2 B..... | 1 | 1 | 1 | 1 | 1 | 1 |
| 2d loader and pike..... | 5 | 6 2d sponger, 1 B..... | 1 | 1 | 1 | 1 | 1 | 1 |
| 1st shotman and fire..... | 7 | 8 2d shotman and pump..... | 1 | 1 | 1 | 1 | 1 | 1 |
| 1st handspike and pike.... | 9 | 10 Train tackle..... | 1 | 1 | 1 | 1 | 1 | 1 |
| 1st captain, 2 B..... | 1 | 2 2d captain, 1 B..... | 1 | 1 | 1 | 1 | 1 | 1 |
| Powderboy..... | ... | ..... | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of arms..... | ... | ..... | 5 | 8 | 2 | 2 | 3 | 3 |

GUN'S CREW COMPOSED OF 8 MEN AND A POWDERBOY.

| Titles of gun's crews on left side of gun. | Gun Nos. | Titles of gun's crew on right side of gun. | ARMS. | | | | | |
|---|-------------|---|---------|------------|----------|--------|----------|--------------|
| | | | Swords. | Revolvers. | Pistols. | Pikes. | Muskets. | Battle-axes. |
| 1st loader, 2 B..... | 8 | 4 1st sponger, 2 B..... | 1 | 1 | 1 | ..... | ..... | ..... |
| 2d loader and pikeman.... | 5 | 6 2d sponger and pike..... | 1 | 1 | 1 | ..... | ..... | ..... |
| Shotman and pumpman.... | 7 | 8 T. T., fireman..... | ..... | ..... | ..... | 1 | 1 | 1 |
| 1st captain, 2 B..... | 1 | 2 2d captain and hands, 1 B..... | 1 | 1 | ..... | ..... | ..... | ..... |
| Powderboy..... | | | 1 | 1 | ..... | ..... | ..... | ..... |
| Total number of arms.... | | | 4 | 2 | 2 | 2 | 8 | 2 |

GUN'S CREW COMPOSED OF 6 MEN AND A POWDERBOY.

| Titles of gun's crews on left side of gun. | Gun. Nos. | Titles of gun's crew on right side of gun. | ARMS. | | | | | |
|---|--------------|---|---------|------------|----------|--------|----------|--------------|
| | | | Swords. | Revolvers. | Pistols. | Pikes. | Muskets. | Battle-axes. |
| 1st loader, 2 B..... | 8 | 4 1st sponger and pikeman..... | 1 | 1 | 1 | 1 | 1 | 1 |
| 2d loader, shot. and pump. | 5 | 6 2d sponger and fireman..... | 1 | 1 | 1 | 1 | 1 | 1 |
| 1st captain 2 B..... | 1 | 2 2d capt., hdsbk., train tackle, 1 B. | 1 | 1 | 1 | 1 | 1 | 1 |
| Powderboy..... | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of arms. | ..... | ..... | 8 | 2 | 1 | 1 | 2 | 2 |

SMALL ARMS OF MASTER'S DIVISION.

| Stations. | Ratings. | Arms. |
|------------------------|-----------------------------|---------------------------|
| Conn..... | Quartermaster | Pistol and Sword..... |
| Wheel | Quarterm. and Seamen | Do. |
| Signals | Quartermaster..... | Do. |
| Do. | Boys | Pikes |
| Relieving Tackles..... | Quartermast. and O. S. | Swords..... |
| Main Braces..... | C. A. G..... | Pistol and Sword..... |
| Mastmen | B. M..... | Pist., Sw'd. and Bat.-axe |
| Do. | Seamen and O. S. | Pikes and Battle-axes. |
| Topmen | Do. | Muskets..... |
| Forecastle | C. F..... | Pistol and Sword..... |
| Bell | S. C..... | Do. |

39. The Captain will designate the different hatchways which shall be used by the Boarders and others from each gun when they are called upon deck at quarters. Cutlasses should not be drawn nor bayonets fixed until ordered, and in moving from one part of the deck to another should be sheathed to avoid accidents.

40. The use of *fire-arms* in the tops being considered dangerous, and only admissible under very peculiar circumstances, they are never to be used there without the express direction of the Captain.

CHAPTER II.

DUTIES AT QUARTERS, IN BATTLE OR EXERCISE.

Captain.

41. THE CAPTAIN, when at general quarters, either for exercise or in action, is to superintend and take the general direction of everything connected with the management of the ship and the service of her armament.

42. He will from time to time carefully inspect the ship, in order, before commencing a general exercise, to ascertain that all the required and proper preparations have been made for battle. When time and other circumstances will permit, he will always make this inspection before going into action, and when prevented from making it personally he will direct it to be made by the Executive Officer.

43. When engaged with an enemy at so great a distance as to require the guns to be elevated, he will, if practicable, cause the distance to be ascertained by observation, and when that cannot be done, will estimate the distance, and from time to time send directions to the Officers of gun divisions for what distances the sights of their guns should be set, and the nature of the projectile, and, if a shell be used, the time of the fuse, (*see*

article 284,) and also the cartridges to be used, whether for "distant," "ordinary," or "near" firing.

44. He will determine and direct when two shot may be fired; when "quick-firing" may be permitted; when small arms shall be distributed and loaded; when Boarders shall be called up, and when they shall assail an enemy. He will receive, through the Executive Officer, the reports from all Officers commanding divisions.

Executive Officer.

45. The EXECUTIVE OFFICER, under the direction of the Captain, and with the aid of the Master, will work the ship when in action or at general quarters.* He will receive the reports of the Officers of the different divisions and others, and communicate them to the Captain of the ship.

Signal Officer.

46. The SIGNAL OFFICER is to see that everything is prepared for making and answering signals promptly,

* This arrangement continues to the Executive Officer his usual duties when all hands are called for other special purposes; it also places him where he will always be immediately informed of all the evolutions ordered by the Captain, as well as of the objects proposed to be accomplished by them, and in case any accident should disable the Captain, the Executive Officer will be ready to carry out his views without mistake or delay.

By employing the Master as an assistant to the Executive Officer, additional security is given against any confusion or delay, which might otherwise be caused by the inability of either of the superior officers to continue the performance of their duties.

and will make all such as the Captain may direct. He will provide himself with a watch, pencil, and signal note-book properly ruled.

47. He will note and report to the Captain all signals that are made to or by other vessels of the squadron, or other vessels in sight, and also note the time at which each signal was made. He will observe and report any material change which may take place in the positions of the vessels of the squadron, or of other vessels, and every event of moment that may occur. •

Master's Division.

48. The MASTER will cause the persons in his division to sling the yards and gaffs, to stopper the topsail sheets, to lead out the preventer and other braces, and will see that they are clear, and toggled to prevent them from unreeving.

49. He will have the *fighting stoppers* at hand in the chains and tops for stoppering the rigging; hatchets and axes ready for clearing away any casual incumbrances from the guns; axes and hatchets for this purpose must be sharpened, covered with painted canvass, and labeled "not for general use;" and will cause proper arrangements to be made for applying and securing grapnels, if they should be required.

50. He will see that the hammocks are compactly stopped down, stowed and covered, and will cause the boat and boom covers to be hauled over and securely

stopped down ; the relieving tackles to be hooked and ready for use ; a compass to be placed to steer by ; and see the spare tiller at hand, and the chronometer and other instruments put out of the reach of shot, and as much as may be, relieved from the jar of the guns.

51. In case the Captain should give orders for sending small arms and ammunition into the tops, he will attend to having them sent there, and will be watchful that they are not so used as to expose the sails and rigging to danger from taking fire ; and in order to furnish a sufficient supply of water, in case of accident, he will have four fire-buckets fitted for each top, with laniards long enough to reach the water from the yard arms, and these should be filled with water in preparing for action.

52. On the probability of an engagement, when the ship is on soundings, the Master will have the ground-tackling ready and clear ; boats ready for getting out, and every preparation made for towing, warping, anchoring and getting springs upon the cables ; and have leads and lines in the chains. If at anchor, he will have the boats dropped astern, the oars secured to the thwarts, and, if directed, have the plugs ready to be taken out that the boats may fill, and also cause the spare spars to be put overboard.

53. Whenever the cables are bent that they shall be kept stoppered until wanted for use.

54. In action, besides aiding the Executive Officer in working ship, the Master is to pay special attention to the steerage of the vessel, and to the rigging, sails and

spars, and will see that the stoppers are properly applied, and damages repaired as speedily as possible.

In vessels where there is no Signal Officer, the Master, in action or general exercise, may be directed to perform the duties of Signal Officer.

55. The Boatswain, being the assistant of the Master, is to see that the rigging, especially forward, is kept clear, and that all damages are promptly reported and repaired. In the absence of the Master, all the above preparations will be at once made by the Boatswain, and reported to the Executive Officer by him.

Engineer's Division.

56. The CHIEF ENGINEER will see all proper preparations made for repairing damages to the engine and its dependencies, and will have the apparatus for extinguishing fire ready for immediate use. As soon as these preparations are fully made, and his men mustered, he will report his division ready to the Executive Officer. He will also report such damages as may be received in action, and what assistance is required to repair them. And he will have charge of the preparations made for extinguishing fires below.

Powder Division.

57. The Officer commanding this division, when called to quarters for general exercise or action, will receive from the Captain the keys of the magazines and shell room, and of their respective water-cocks, and will deliv-

er them to the persons in charge, who are not to open them without his special order.

58. He will have the fire screens let down, and the light rooms and the deck under his charge lighted.

59. He will see that the shot and shell whips are in place and in working order, and that shot troughs are placed for conveying shot where required ; that the Gunner and his Mates at the magazine hatches and scuttles, and the persons stationed at the shell room scuttles, are ready to open them when the order is given.

60. That all the precautions mentioned in the duties of Gunner and Carpenter have been taken against fire, namely : that the division tubs are filled with water, and that wet swabs are placed by them and under all the lower scuttles through which passing-boxes are returned ; that a *fire tub* is placed at the bottom of each shoot for the return of empty boxes ; that it is nearly filled with water and has its wire grating shipped ; that a proper supply of fresh water is provided for the use of the men ; that the hatchways of the decks next above that on which the Powder Division is stationed are properly covered ; that the air ports are closed and secured ; and that the hose is screwed to the force pumps and ready for use.

61. He is to see that the means which are provided for lowering the wounded are ready and properly fitted, and that the wounded, when lowered down, are conveyed to the part of the vessel set apart for the Surgeon's Division.

62. He will also see that all obstructions to the safe

and rapid passage of powder, shot, and shells are removed, and when every preparation for action has been made in his division, will report it ready to the Executive Officer.

63. When the order is given from the Captain to open the magazines, shell rooms, and scuttles, he will direct the Gunner and Gunner's Mate to repair to their respective scuttles, put on their magazine dresses and shoes, divest themselves of every article of metal, and see that the men stationed with them do the same; they are also to see that wet swabs and cans of fresh water are provided.

64. The magazines being opened, the lids of the tanks are not to be unscrewed until orders are given to that effect. Then the Gunner and his Mate, and their assistants in their respective magazines, will open as many, and no more tanks than are necessary to supply charges of the kind ordered, which they will pass up to the men stationed on the deck above to receive them. These men will be particularly careful to observe the orders transmitted from time to time designating the kind of charges required at the guns.

65. While at general quarters he will see that the men preserve their proper stations in silence, order, and coolness; and he will give particular attention to the sufficient and correct supply of powder and projectiles to the various divisions, and that in time of action, or of exercise with powder, the passing-boxes, after being once taken out of the magazine, are not passed into it again,

or even inside of the screen, during the whole of such action or exercise.

These duties are of the highest importance.

66. In exercise, where no powder is used, he will see that such substitutes for the various charges as the Captain may direct are passed up in their proper boxes, so that the number of rounds, and the kind of charge, whether "distant," "ordinary," or "near," may be ascertained and compared with those ordered. Should any defect or deficiency in the arrangement for giving a full supply to the guns be discovered, it is to be reported immediately to the Captain, in order that a remedy may be applied as speedily as possible by additional men or other proper means.

67. The Carpenter will see that the hatches on the deck next above the berth or orlop are properly covered with gratings and tarpaulins, and that the air ports are closed and secured.

68. He will then cause all the pumps to be rigged, namely, the main pumps, for freeing the ship in case of leaks, and the force and channel pumps. He will have the engine also rigged and filled to supply water for extinguishing fire.

69. He is specially charged with the care and distribution of articles for stopping shot-holes, or repairing other injuries to the hull, which may be received in action, viz.: shot-plugs and mauls; pieces of pine board from eighteen inches to three feet long, and from twelve to fifteen inches wide, covered with felt or fearnaught,

previously coated with tar or white lead ; patches of sheet-lead with nail-holes punched ; and trowser-slings for lowering men outside the vessel, to be provided with a pouch or pocket to contain a hammer and nails. Tarred canvas or oakum should be prepared to shove into the shot-holes before the patches of board or lead are nailed on. Although shot-plugs are still to be allowed, the means just described are most to be relied on.

70. He will, when directed, cause the cabin and other bulkheads to be taken down, and every other obstruction removed which comes within his department, and may interfere with the working of the guns, or the passage of ammunition ; and having performed this service, will report to that effect to the Officers of the Divisions in which such obstructions existed.

71. When these preparations are completed, he will see that the men under his direction are in their proper stations ; and when all their preparatory duties have been performed, will so report to the Executive Officer, and to the Officer commanding the Powder Division what relates to that division.

72. During an action, the Carpenter will attend the pumps, sound the well frequently, and should he discover indications of serious injury below the water-line, will immediately make them known personally, either to the Captain or to the Executive Officer, *and to them only.*

73. During an action, such of the Carpenter's crew as are stationed in the wings or on the orlop in line-of-

battle ships, or on the berth deck in other vessels, will be constantly on the look out for shot-holes.

When a shot enters, they are to make its position known by reference to the numbers of the ports under or near which the hole is found, and its distance below or above the water-line, as shown by the interior line corresponding to it, already described in the general duties of the Carpenter, and are also to apply promptly such remedy themselves as may be in their power.

74. The MASTER-AT-ARMS, assisted by the Ship's Corporals, will see the galley fire and all unauthorized lights put out ; that the lamps are in their places, properly trimmed and lighted ; and that the lenses and reflectors are cleaned.

After the magazines have been swept, closed, and secured, and the retreat has been beaten, the Master-at-arms will see that the lights in the light-rooms are extinguished, and apply to the Executive Officer for permission to renew the usual lights and fires.

Surgeon's Division.

75. The SURGEON or senior Medical Officer will see that all necessary preparations are made for the reception and treatment of the wounded in the part of the ship which may have been set apart by the Captain for that purpose, and report to the Executive Officer when such preparations are completed.

76. He will cause a sufficient number of *tourniquets*, or temporary substitutes for them, to be distributed to

the Quarter Gunners of the different divisions, and to such men in each top as may be appointed to receive them; and he will take care that the persons in his division, and such others as the Captain may direct, are instructed in the use of tourniquets, to prevent, as far as possible, any dangerous loss of blood before the Surgeon or his Assistants can attend to wounded men.

Officers Commanding Divisions of Guns.

77. Each Officer Commanding a Division of Guns is to see that all persons belonging to it are present; that all the prescribed arrangements are duly and promptly made; that every article designated for use in the division is in order and in place; that the decks are wet and well sanded; that the hand-swabs at the guns are wet; and that any small arms that may be distributed among the men of his division are properly loaded at the time directed by the Captain.

78. In action he will cause the wounded of his division to be promptly and properly conveyed to the Surgeon, but will see that no man leaves his quarters on pretence of assisting the wounded. Four men, "aids to wounded," should be attached to each Division of Guns, so as not to take men from guns for that purpose.

79. On the lower deck of line-of-battle ships, or the main deck of frigates, and spar deck of single deck vessels, he will see the hatchways in the range of his division properly covered by the Carpenter's crew, and the

scuttles and whips duly prepared for passing powder, shot, and shells.

80. He will be particularly careful to prevent the men from loading the guns improperly, or otherwise than may be specially ordered, and will prevent any unnecessary noise.

81. He will see that the guns are very carefully pointed and properly aimed; that there is no firing until correct sight can be obtained, as random firing is not only a waste of ammunition, but it encourages an enemy when he sees shot and shell falling harmlessly about and beyond him.

He will carefully impress upon the Captains of guns that there is no excuse for several successive bad shots, as observation of the first or second will surely indicate an erroneous estimate of distance, and afford means of correcting it. Accuracy of fire is to be encouraged rather than rapidity.

82. He will also take care to prevent confusion at the powder scuttles in the range of his division, and that all orders which require to be repeated are duly passed. In case of accident to the Powder Passers, he will promptly supply their places by such men as can be best spared from his division.

83. He will take care that each gun in his division is provided with all the "Equipments and Implements" prescribed for its use, and that the "spare" articles which may be required in his division in action are in place. (*Article 85.*)

84. He will report to the Executive Officer when all preparations have been made for action ; and also after action and exercise, when the guns have been properly secured, and the stores and implements belonging to his division have been returned to their places.

Equipments and Implements.

85. Those for broadside guns, whether mounted on two or four truck carriages, or on slides, are to be as follows, viz. :

| Articles for each gun. | Where they are to be put when the gun is secured. |
|---|--|
| Carriage complete, with bed and quoin, or elevating screw. | At its port. |
| Breeching with shackle-bolts and pins. | At the gun. |
| Compressors and levers, pivot-bolt and housing chock, for Friction Carriages. | Do. |
| Two side-tackles..... | Hooked to the side-tackle bolts on each side of the port and of the carriage. |
| One train-tackle..... | Hooked to the side-tackle bolts in the side, with the parts of the fall round the breech of the gun. |
| Two handspikes*..... | Resting on the bed bolt, inboard ends secured by beackets. |
| One tompon with lanlard and wad. | In the muzzle of the gun. |

* *Marsilly* carriages require a roller handspike each.

| Articles for each gun. | Where they are to be put when the gun is secured. |
|---|--|
| One sponge and cap*..... | On the beam or carling over the right side of the gun (on movable brackets). |
| One rammer* | On the beam or carling over the left side of the gun (on movable brackets). |
| One lock, with string and vent plug complete, with cover and strap | In place on the gun. |
| One breech sight with cover..... | Do. |
| One re-enforce sight with cover... | Do. |
| One priming wire and one boring bit, with beackets for the wrist. | Inside of the brackets of the carriage, near the breech. |
| One fire-bucket with lanlard..... | On gun-decks, close to the side, near the beam over the gun; on spar-decks, round the capstan and the boats forward. |
| One battle lantern, with candle or lamp trimmed and primed, but provided for gun-decks only; none for spar-decks. | In the fire-buckets. The candle in supply box. |
| Battle-axes (as prescribed according to the number of men at gun).— <i>See Art. 101.</i> | Inside of the brackets. |

* The rammers and sponges belonging to the broadside guns of spar-deck divisions of all ships having topgallant forecastles, or other light decks, may be kept under the forecastle or light deck when not in use. In ships not provided with these decks, they are to be kept at the guns inside the brackets; or if that cannot be done, triced up overhead on the next deck below.

| Articles for each gun. | Where they are to be put when the gun is secured. |
|--|---|
| One hand swab..... | On the breast piece of the carriage. |
| Two chocking quoins for truck carriages. | When not in use, between the brackets and the bed. |
| Two laniards for each half port.... | In place. |
| Laniards, chain pendants, runners and tackles for tricing up, and bars and keys for securing lower deck ports. | In place. |
| Ten shot for shot guns..... | In racks round hatches nearest the gun. |
| For shell guns, one shell in its box. | Between the trucks on the left side of the gun. |
| Ten selvagee wads for shot and shell guns. | On the breast piece of the carriage strung on a pin. |
| Two housing chocks for lower deck guns. | Placed before the <i>front trucks</i> when the gun is run in for housing. |

86. He will also assure himself that the following articles, which may be required, are in readiness in his division, and prepared for use, namely, One rattle for calling Boarders, one division tub for fresh water, one spare bed and quoin for carriages requiring them, two spare gun trucks, four spare handspikes, one worm, one scraper, one bristle sponge, two spare breechings, four swabs, and if any of the guns be on slides, a spare pivot-bolt. Of these

articles, the worm, scraper, sponge, and spare breechings are to be becketted up between the beams and carlings on the gun decks as far as practicable, and those which cannot be so placed, will be kept at hand in the store-room or other convenient place. A ladle is supplied for each calibre on board, and will be kept ready in such place as may be designated by the Executive Officer.

The above allowance of articles designated as "spare," including worm, scraper, sponge, and swabs, is upon the supposition that each division is composed of five guns and their opposites. In case the number of guns should be either more or less, the article will be increased or diminished proportionably to the nearest whole number.

§7. He will take care that the Quarter Gunners of his division keep the two division boxes marked "supply" and "reserve" constantly provided with the following articles, all in good order, viz.:

The "*Supply*" box with a waist belt for each Boarder, Pikeman, Fireman, Sailtrimmer, and Pumpman; a primed candle for each battle-lantern; a thumbstall and vent-guard for the 1st and 2d Captains of each gun. The belts of Boarders to be furnished with a frog for a pistol, with its cartridges and percussion caps; those of 1st and 2d Captains of guns with a box containing fifty primers, fitted to slip on the waist-belt. Those for Firemen, Sailtrimmers, and Pumpmen have each a frog for the battle-axe.

The "*Reserve*" box with one drill-brace, three vent-drills, one vent-punch, two gun-locks and strings com-

plete, a flask of priming powder, two boring bits, three priming wires, eight thumbstalls, four boxes of percussion primers, one box of friction primers, one spare lock-string for each gun, and one fuze-wrench, a shackle-punch and pin, and some rags for wiping. These boxes are to be placed by the Quarter Gunners in their respective divisions, near the mast, and on the opposite side to that engaged.

In vessels of the class of Frigates and upward, these boxes are to be, on covered decks, kept in their several divisions, and secured overhead.

On spar decks they are to be kept under the break of the poop and the topgallant forecastle, and in vessels having neither poop nor topgallant forecastle, between the beams on the berth deck. They will be kept under lock and key.

88. He will see that the Quarter Gunners of divisions, and others appointed for the purpose, obtain the requisite number of tourniquets and distribute them to the men selected to use them. (*See article 76.*)

BROADSIDE GUNS.

Stations and Gun Numbers.

89. The following are to be the *gun numbers and stations* for a gun's crew composed of sixteen Men and a Powderman, when working broadside guns on lower decks; *on other decks* 15 and 16 are 3d and 4th Side Tacklemen.

| Left Side. | Gun Nos. | | Right Side. |
|--------------------------|----------|----|-------------------------|
| 1st loader..... | 8 | 4 | 1st sponger..... |
| 2d loader..... | 5 | 6 | 2d sponger..... |
| 1st shellman..... | 7 | 8 | 2d shellman..... |
| 1st side tackleman..... | 18 | 14 | 2d side tackleman..... |
| 1st port tackleman..... | 15 | 16 | 2d port tackleman..... |
| 1st train tackleman..... | 11 | 12 | 2d train tackleman..... |
| 1st handspikeman..... | 9 | 10 | 2d handspikeman..... |
| 1st captain..... | 1 | 2 | 2d captain..... |
| Powderman..... | | | |

Powderman near the midships, and on the left of the gun.

For a gun's crew of *fourteen men* and a Powderboy, or of *twelve men*, the higher numbers are those to be omitted, and the stations and duties of all the others remain unchanged.

With a gun's crew of *ten men*, all the numbers continue with the same stations and duties excepting No. 10, who becomes Train Tacklemen, and the 2d Captain handles the handspike.

With a gun's crew of *eight men*, numbers from 1 to 7 inclusive retain the same stations and duties; No. 2 will, in addition to his duties as 2d Captain, also attend to the handspike, and No. 8 becomes Train Tackleman.

With a gun's crew of *six men*, all the numbers retain the same stations and duties, excepting that No. 5 also acts as Shotman, and No. 2 attends to the handspike and train tackle in addition to the duties of 2d Captain.

90. This arrangement exhibits the gun's crew placed as the men should stand when first assembled at quarters, either for inspection or any ordinary exercise. It is

intended that the men are then to stand parallel with the gun, and facing in-board.

91. Calls for Assembling at Quarters.

BEATS OF DRUM.

1st. THE ORDINARY BEAT will be the call for INSPECTION at general quarters.

2d. The ORDINARY BEAT, *preceded* by ONE ROLL—EXERCISE at general quarters, *without powder*.

3d. The BEAT QUICK—ACTION ; or EXERCISE at general quarters *with powder*, as though engaged IN BATTLE.

4th. "WHEN AT QUARTERS," a *roll of the drum* will be a signal for "SILENCE AND ATTENTION !" All firing will immediately cease, and the next order awaited.

92. On assembling at quarters for inspection or general exercise, unless directed otherwise, *in port*, the men are first to go to the starboard guns on the spar deck, the port guns on the main deck, the starboard guns on the next deck below, and so on. *At sea* they are first to go to the weather guns, or, if the ship be dead before the wind, to the same sides as in port.

93. When assembled for *inspection*, besides seeing that all the guns and articles belonging to them are in order and in place, it is suggested that the men, without arms or implements, or casting loose the guns, shall be frequently called away *and mustered* in their stations as Boarders, Pikemen, Sailtrimmers, and Firemen ; and also

practiced in shifting from one side to the other, and in taking their places for fighting both sides at once.

94. On assembling for exercise at general quarters without powder, after the men have been mustered and the divisional reports made, the order will be given: "CAST LOOSE AND PROVIDE!"

Then the starboard watch will *provide and cast loose* the odd numbered guns, and the port watch will *provide and cast loose* the even numbered guns.

The 1st parts of guns' crews on the *starboard side* providing and casting loose the *starboard*, and the 2d parts the *port* guns. The 1st parts of guns' crews on the *port side* the *port*, and the second parts the *starboard* guns. In securing guns the same order of distributing the men is to be observed.

When both these services of providing and casting loose have been performed, and the luffs choked or hitched and trucks chocked, the men are all to return to the guns at which they were mustered, and, taking their places, await in silence further orders, if not already given.

95. When assembled for exercise as though actually engaged in battle, besides what is prescribed for an exercise at general quarters without powder, the further preparations indicated hereafter will be made. *The guns' crews will proceed at once to provide and cast loose both sides without waiting to be mustered, or for any further orders.*

96. The call for *Boarders* to repair to the spar deck

will be by the *rattle* and verbal order, repeated by the Officer of each division of guns. They should be trained to form promptly on the opposite side to that engaged, near the hatch by which they ascend.

On the first call or order the first division only will repair to the spar deck, led by their officers. If the call or order should be repeated before the first division shall have returned to their guns, the second division will immediately repair to the spar deck.

97. The call for "*Pikemen*" to "*repel boarders*" will be by *sounding the Gong*. At this signal *all* the *Pikemen* will assemble on the spar deck with their muskets.

98. "*All hands*" will be summoned to *repel boarders* (see article 29) by springing the rattles and sounding the gong together, and by verbal orders.

99. "*Sailtrimmers*." The particular division that may be wanted at a time will be called by *passing the word for it*.

100. The call for "*Firemen*" to repair to the spar deck will be given *verbally* and by *striking the ship's bell rapidly*. The *rapid* ringing of the bell will be the FIRE ALARM at all times, when the crew will immediately assemble at quarters.

101. *Boarders, Pikemen, and Sailtrimmers* of the *spar-deck guns*, or any portion of them, and of the Master's division, as well as the Marines, may be ordered from their quarters to perform a particular service, *without any call*, whenever the Captain may deem proper.

102. Men called for any of the foregoing duties will,

on reaching the spar deck, form on the gangway, upon the side not engaged with the enemy, unless otherwise directed at the time.

103. When called to quarters, every person is to repair to his station promptly and without unnecessary noise ; and on the order "*to your quarters*" all will return to their stations in the same manner.

PREPARATIONS FOR EXERCISE

At General Quarters without Powder.

104. Sling the topsail yards and gaffs, and put the preventer braces in place ; distribute fighting stoppers and jiggers ; stopper the clews of the topsails ; get whips on each side of the lower masts for tricing up the pendant tackles, and also the mast bands and fishes required for securing a crippled mast. Make arrangements for using grappels ; get hauling lines ready for sending small arms and ammunition into the tops ; if not on soundings, haul over board and boom covers and stop them down ; bring up and stow hammocks, if down ;* haul over and

* The Executive Officer of the ship should appoint a sufficient number of men in each watch for the purpose of stowing the hammocks of the watch below in case of being called to quarters in the night, so as to prevent confusion and insure the greatest possible despatch in clearing for action. The requisite number of men for this purpose is as follows :

For a Ship of the line, twelve men in each watch.

" Frigate, ten " " "

" Sloop-of-War, eight " " "

secure the hammock-cloths ; hook and mouse the relieving tackles ; place the spare tiller and compass at hand ; put the chronometers, and other instruments of navigation, out of the reach of shot ; distribute the small arms, together with their accoutrements and a supply of filled cartridges, to the men appointed to use them ; place axes and hatchets at hand on the spar deck for clearing away incumbrances at guns.

If underway and on soundings, get the boats ready for hoisting out ; the ground tackle ready for use, and keep it clear, and make every preparation for towing, warping, and anchoring with springs on cables ; stopper the chains ; get lights in the light rooms, including those of the shell rooms ; light powder division ; also gun-decks, if at night, *and it be ordered by the Captain* ; drop magazine screens ; get shot and shell-whips, and buckets or nets, in place ; rig canvass shoots for returning empty passing-boxes ; remove every obstruction to the free passage of powder ; clear away and open shot-lockers ; see the hatchways of the next deck above the powder division properly covered ; division and fire-tubs in place, with wet swabs by them, and at the landing of each line of scuttles through which the passing-boxes pass ; rig

By this arrangement four men will always be at hand to stow each netting. The stowage should commence in the middle and at each end at the same time, the men placed in the middle standing face to face and stowing towards the ends, while the others stow towards the middle of each netting. Hammocks make the best stowage on the bight and perpendicular, when that method can be followed.

main, force, and channel pumps and fire-engine, which fill with water ; get light Jacob-ladders and slants ready for lowering the Carpenters outside and materials for stopping shot-holes ; take down cabin and other bulk-heads, when directed, and pass them below ; sand the decks ; place a bucket of water and a wet swab in rear of each gun ; have spare breechings at hand ; rope ladders for hatchways in place ; a bag, to be supplied from one reserve box, containing a flask of priming powder and the following *spare* articles : two locks, four lock-strings, eight thumbstalls, two boring-bits, two priming-wires, a shackle-punch and pins and some old rags, to be slung round the neck of each Quarter Gunner of each division of guns ; rammers and spongers placed, and the latter uncapped ; one worm in place, on each side of the deck, for each division, and a ladle at hand for each calibre on board ; pistols, in frogs furnished with cartridges and caps, and cutlasses and battle-axes, belted round the respective persons designated to wear them ; marines accoutred and under arms, and distributed as the Captain may direct ; tourniquets to be distributed, as may be judged necessary, to each Quarter Gunner of a division, or otherwise. (*See articles 76 and 88.*)

PREPARATIONS FOR EXERCISE

AT GENERAL QUARTERS WITH POWDER, OR AS THOUGH
ENGAGED IN BATTLE.

105. Crew cast loose the guns ; shell-rooms and magazine are opened ; powder and shells passed up, and everything ready for firing, the order for which is awaited. If the beat is followed by orders from the quarter-deck to fire, then this is performed as soon as each gun is ready. In this case, besides what has just been prescribed for a General Exercise *without powder*, the following further preparations will be made : Put out galley fire, and all unauthorized lights ; light match and place it in manger ; open magazines and powder tanks, and also shell-rooms, when ordered ; close and secure air-ports ; fill division and fire tubs with fresh water ; place cans of fresh water and wet swabs in magazines and shell-rooms ; light up the cockpit, or other place, for the wounded ; place mattresses, and if there be room, sling spare cots ; get ready the amputating table, instruments, bandages, lint, medicines ; have a plentiful supply of fresh water and swabs, and sprinkle the decks. Make a particular examination of all the arrangements for extinguishing fire ; see that force-pumps and hose are in good order, and the men stationed at them in their places.

Providing Broadside Guns.

106. When the exercise of broadside guns is to be

confined to one side only, each *gun's crew* is to provide its own gun, on the side at which it is ordered to assemble, as follows: but when the guns on both sides are to be exercised at once, each *part* of a gun's crew is to provide its own gun; "crews dividing as directed in art. 94." etc., etc., each Captain, Loader, Sponger, etc., doing separately what is done by both himself and his second when the exercise is confined to one side only.

107. Captains of guns to provide themselves with percussion primers, thumbstalls, and priming-wire, and to see that the men of their respective parts of the gun's crew discharge their several duties promptly and carefully.

108. Spongers provide sponges and rammers.

109. Loaders provide a bucket of water and a wet swab.

110. Shell or shotmen provide a sufficient supply of selvagee and six junk-wads, and supply the racks along the waterways and hatchways with shot from the lockers as required.

111. Handspikemen see the handspikes in place, and then assist in getting up shot for the guns.

112. The Powderman or Boy is to provide an empty passing box, if no powder is to be used; otherwise, he is to present himself at the appointed place to receive a full one.

113. The Fireman is to take down the fire bucket and place it and the battle lantern in their appointed places. On gun-decks the lantern should be hung up at

the ship's side, or in rear of and between the guns, as may be directed, and lighted when ordered by the Captain, and the fire bucket directly in rear of the gun. On spar decks the bucket may be laid on the deck, or hung up in any convenient place in rear of and near the gun.

114. Side tacklemen provide sand and water, and sprinkle and sand the decks, if directed.

115. Quarter Gunners of divisions, besides equipping themselves, as already directed (*article 104*) with a bag of spare implements, will attend to the "Supply" and "Reserve" boxes of their divisions, (*see article 87,*) and distribute the belts, primer boxes, and other articles which they contain, to the gun's crews, as soon as practicable, and then keep themselves ready to furnish any reserved or spare articles which may be required, such as spare breechings, ladles, and worms, and will see the battle lanterns provided with candles with primed wicks, ready for lighting when ordered by the Captain.

116. The swords and pistols should be always available for the Boarders at the shortest notice; but their particular disposition at quarters, and what time the pistols shall be loaded, will be determined by the Captain, as in his judgment circumstances at the time may require. Pistols should be loaded on the probability of action without further orders.

Arrangements for Delivering and Distributing Powder.

117. In making arrangements to deliver and distrib-

ute powder from the magazines for action, the following general considerations and rules should govern.

118. Cartridges, as experience proves, can be passed up each independent chain of scuttles leading from the magazine to the point at which the Powder-boys are to receive the full boxes, of the rate of one every six or seven seconds.

119. Experience also proves that, under the most favorable circumstances, the broadside guns of a man-of-war cannot be advantageously fired oftener than once every seventy-five seconds.

Hence it may be received as a rule that a single chain of passing scuttles is abundantly sufficient to supply powder for a division of guns as large even as eight of a side; and that it is also sufficient when both sides of such a division are to be used at once, for then the firing of each piece is unavoidably retarded by the division of the gun's crews.

120. No one chain of scuttles ought to be required to supply cartridges for more than a single description of guns,* unless their cartridges be the same in diameter, weight, and form, and their passing-boxes alike, as in the case of the 8-inch shell gun of 63 cwt., and the 32-pdr. of 57 cwt. If, therefore, there be on a deck of guns but one differing from the rest in calibre, class, or assimilation of cartridges, that one should have a separate chain of scuttles for its supply, in order to guard effectually against confusion, or at least, delay. In a word,

* See Table of Charges for Great Guns.

each additional calibre or class of guns, unless the cartridges be assimilated, and the passing-boxes alike, involves an additional chain of passing scuttles for its supply; and it should be borne in mind that errors with respect to cartridges of guns of the same calibre, but differing in class, are more to be apprehended than with guns differing only in calibre.

121. If the guns on a deck be all of the same calibre and class, or of like cartridges and passing-boxes, then one chain of scuttles to supply the forward half of those guns, and another to supply the after half, will be all sufficient.

122. For each chain of passing-scuttles there will probably have to be—

One man in the magazine to deliver charges from the tanks.

One man in the passage to receive and pass those charges through the scuttle in the orlop or berth deck.

One man at the passage scuttle on the orlop, or berth deck, to receive the charges, and pass them to the screen.

One man just outside of the screen to receive the charges through a flapped hole therein, and put them in the empty passing-boxes.

One, two, or three Runnerboys (according to the distance) to run, on the orlop or berth deck, with full passing-boxes, from the screen to the scuttles through the deck, and back again with the empty boxes to the screen.

One man, a very careful one, at the bottom of the can-

vass shoot, to receive the empty passing-boxes, strike them, in an inverted position, over the fire-tub, and inspect them carefully before allowing them to be taken away to be replenished.

One man, on the orlop or berth deck, at the passing scuttle through the deck above, to pass up full boxes.

One man at the passing-scuttle on the next deck above the orlop or berth deck to receive and pass up full boxes, or in the case of a single-deck vessel, or of distribution on the main deck of a frigate, or on the lower deck of a ship-of-the-line, to receive and deliver them to Powder-boys.

One man at the passing-scuttle on the second deck above the orlop, or berth deck, to receive and pass up full boxes; or, in the case of a frigate, or distribution on the main deck of a ship-of-the-line of two decks, to receive and deliver them to Powder-boys.

And one man at the passing-scuttle on the third deck above the orlop to receive and deliver full boxes to Powder-boys on the spar deck of a ship-of-the-line of two decks.

Thus each chain of scuttles will require—

Seven men to supply its guns on the first deck above; as, for example, the lower deck of a ship-of-the-line, the main deck of a frigate, or the spar deck of a sloop-of-war, or other single-deck vessel.

Eight men for the spar deck of a frigate, for the main deck of a ship-of-the-line of two decks, or for the middle gun deck of a ship-of-the-line of three decks.

Nine men for the spar deck of a ship-of-the-line of two decks, or for the main deck of a ship-of-the-line of three decks.

And ten men for the spar deck of a ship-of-the-line of three decks. ●

Besides, each of these numbers—7, 8, 9, and 10—is to be increased by two or three Runnerboys, for the purposes above described.

123. In vessels of and above the class of frigates, or having two magazines—one forward and the other aft—the forward half of the guns on each deck is to be supplied from the forward magazine, and the after half from the after magazine. Thus, for each deck of guns, one scuttle at each of the two magazines, together with its corresponding chain of scuttles, will be sufficient, *if all the guns be of the same calibre and class*, or have like charges. But the introduction on board of any vessel of guns differing in either of these respects will involve the necessity above stated of a separate scuttle of delivery at the magazine, and also of a distinct chain of scuttles connected with it for the exclusive supply of each variety of charges that may be introduced.

In this case, the exceptional guns should be supplied, whenever practicable, from the larger magazine when there are two differing in size.

124. In single-deck vessels carrying more than sixteen guns, all of the same calibre and class, and having but one magazine, two scuttles at that magazine will be

sufficient—one to supply the forward half of guns, and the other the after half.

125. In single-deck vessels carrying only sixteen guns, or less, all of the same calibre and class, or having like charges, one scuttle at the magazine will suffice.

126. Should any single-deck vessel be of such great length, or so remarkable in her armament of guns, although all of the same calibre and class, as to render additional scuttles advisable, they are to be cut.

Passing-Scuttles.

127. All the powder is to be passed up from the orlop, or berth deck, through circular scuttles cut in the deck or decks at places, as nearly as circumstances will permit, immediately abreast of the middle of the particular set of guns to the supply of which each chain of scuttles is specially appropriated. Besides these scuttles for passing the powder up, there are to be corresponding ones for each set, provided with a canvass shoot for returning the empty boxes below. The drawing shows the manner of supplying an upper deck and returning the empty boxes from it. Each deck is to be supplied in like manner by a distinct and separate arrangement through as many independent sets of scuttles as may be the preceding "Arrangements for delivering and distributing powder."

128. Each scuttle is to have a tompion or other means of closing it, so as to be water-tight when not in

use, and to be so placed or regulated in height as not to interfere with the transportation of guns.

129. Should any serious difficulty arise in finding places for cutting any of the different sets of scuttles through the decks, or in the cases of small or very wet vessels, recourse may be had to the gratings of the hatchways. Still, they are always to be cut through the decks whenever it can be done with propriety.

130. For each scuttle at the magazine for the delivery of powder there must be a corresponding flap-hole in the magazine screen, and this is to be regarded as a part of the chain of supply equally with the scuttle itself.

131. When on board ship there are any guns of the same calibre and class, or of assimilated charges, carried on two consecutive decks, all of them may be supplied by the same chain of scuttles, provided the whole number of guns, thus made to depend upon this chain, does not exceed eight of a side. For instance, under the circumstances stated, the chase, or a few shell or other guns on a spar deck, may be supplied by a chain of scuttles intended principally for the main deck guns; or, the shell guns on a main deck being few, may be supplied by a chain intended principally for the deck below.

132. In delivering cartridges from the magazines for serving guns they are to be passed up from the magazine to the orlop or berth deck, before they are put into the passing-boxes, which, in time of action, or when exercising with powder, after being once taken out of the magazine, are not, on any account, to be allowed to go into

it again, or even inside of the screen, during the whole time of such action or exercise. They are to be replenished at the screen, but outside of it.

133. All passing-boxes shall be painted black, with the calibre and charge painted in white letters, two and one-half inches ($2\frac{1}{2}$) long on the side, and one and a-half ($1\frac{1}{2}$) on the top.

134. If, however, there are any guns of the same calibre on *spar decks* requiring lighter charges, the *lower half* of the box shall be painted *white*. For *gun decks* in similar cases the *lower half* shall be painted *red*.

135. *Empty passing-boxes returned by the shoots* are always to be landed upon wet swabs, and then to be turned upside down and so stuck over a fire-tub, as before directed, to free them from any loose fire.

136. One fire-tub nearly filled with water is to be placed on the deck, alongside the bottom of each shoot for returning empty boxes. The top of this tub is to be provided with a stout hoop to ship and unship, with a grating of stout copper wire, the meshes of which are to be made small enough to prevent the passing-box from falling into the water, in case of slipping from the man's hand while being struck over the tub.

Shot and Shell.

137. Shot and shell are to be passed up by hand, or whipped up, by the most convenient hatchways. The hands stationed below at the lockers are to work the whips, each of which being fitted with a toggle, will

indicate when the projectiles are hoisted high enough. In case a shot-locker should be somewhat removed from the hatchway, up which the shot are to be passed or whipped, the shot may be speedily conveyed over the distance by means of a wooden trough fitted for the purpose.

Hatchway for the Wounded.

138. One hatchway, or portion of a hatchway, and that as nearly amidships as possible, is to be reserved for lowering the wounded below, and to be properly provided with a cot or cots, having a whip to each.

NAVAL GUN CARRIAGES.

139. All gun carriages and their equipments are to be made in conformity with directions from the Bureau of Ordnance.

Nomenclature of Ordinary Naval Truck Carriage.

WOODEN PARTS.

Carriage.

- | | |
|---|--|
| <p>A. Brackets of large carriages are made each of two pieces, joined by a jog <i>a</i>, and dowelled. The remaining parts of the brackets are the trunnion holes <i>b</i>, steps <i>c</i>, quarter rounds <i>d</i>, and arch <i>e</i>.</p> <p>B. Transom, let into brackets.</p> <p>C. Breast piece, in two parts; the inner part fixed, by two bolts, into transom; the outer part movable, connected by hinges.</p> | <p>D. Front and rear axletrees, consisting each of square body <i>f</i>, and arms <i>g</i>, jogged into brackets.</p> <p>E. Front and rear trucks.</p> <p>F. Dumb trucks.</p> <p>G. Bed and stool.</p> <p>H. Quoin.</p> <p style="text-align: center;"><i>Implements.</i></p> <p>I. Handspikes.</p> <p>K. Chocking quoin.</p> |
|---|--|

METAL PARTS.

Carriage.

- | | |
|---|---|
| 1. Two cap squares. | 12. Bed bolt. |
| 2. Four cap-square bolts and two keys and chains. | 13. Four axletree bands. |
| 3. Two bracket bolts. | 14. Chafing plates of steps and brackets. |
| 4. Two rear axletree bolts. | 15. Four linchpins and washers. |
| 5. Two side-tackle eye-bolts. | 16. Quoin-plate and stop. |
| 6. One train-tackle eye-bolt. | 17. Ratchet for quoin stop. |
| 7. One transporting eye-bolt. | 18. Four training loops. |
| 8. Two breast bolts. | 19. Breeching thimble (cast iron). |
| 9. Two hinges of breast pieces. | 20. Side-shackle bolts for breechings. |
| 10. Two transom bolts (upper and lower). | 21. Shackle pin, plates, and keys. |
| 11. Two breeching side-shackles and pins. | 22. Two axle stays. |
| | 23. Handspike shoe. |

NOMENCLATURE OF PARTS PECULIAR TO VAN BRUNT'S FRICTION CARRIAGE FOR LIGHT GUNS.

Of Carriage.

140. A, middle transom; B, rear transom. Compressor, composed of eccentric axle *a*, with catch *b*; journals *c c*; levers *d d*; spring catch for do. *e*; compressor blocks *f f*, and clamps *g g*. Trucks D, attached to brackets by brass box and axles; and elevating screw E, (Hart's,) with levers, attached to rear transom.

Of Slide.

F, Compressor plates, under slide, with nose-piece and pivot-hole G. Slot H, with catch-stop I. Training trucks K, attached by brass box. Pivot-bolt, loop, and socket L.

CHAPTER III.

MANUAL EXERCISE.

Exercise of Broadside Guns, on One Side only.

IX-INCH SHELL-GUN, (*as an example.*)

141. WORDS OF COMMAND.

1st. SILENCE! "MAN THE STARBOARD (*or Port*) GUNS!"

2d. "CAST LOOSE AND PROVIDE!"

3d. "RUN IN!" (*preparatory.*)

4th. "SERVE VENT AND SPONGE!"

5th. "LOAD!"

6th. "RUN OUT!"

7th. "PRIME!"

8th. "AIM!"

9th. "READY—FIRE!"

10th. "SECURE!"

It is customary to keep the guns of the Battery loaded at sea; it has been found that the fire of a ship could be

NOTE.—In order not to encumber the text with details, they are transferred to the "Notes on the Manual Exercise," (*art. 225 to 294*) which are to be carefully studied. Also the notes to Pivot Gun Exercise.

commenced in three minutes from the beat of drum, the guns being secured for sea and no notice of what was contemplated announced to men or officers save by the signal for quarters.

This form of exercise therefore proceeds on the assumption that the cannon are not loaded, but the order of the commands may be varied to suit the circumstances of the case.

Guns should never remain loaded longer than necessary, as the cartridge speedily deteriorates by the effects of moisture. If a shell has been loaded twenty-four hours it should be drawn and refuzed.

1. "SILENCE! MAN THE STARBOARD (*or port*) GUNS!"

142. At this preparatory order the strictest silence is to be observed. The Captain faces the port, the men, on the right and left, stand facing the gun; all fix their eyes on the Captain and attentively wait for orders.

2. "CAST LOOSE AND PROVIDE!"

143. The 1ST CAPTAIN commands, sees his gun cleared and cast loose, portlid unbarred ready for tricing up, or half ports taken out; side and train-tackles hooked, the side-tackle to the side training bolt, and the train-tackle to the eye bolt in the deck in the rear of the gun; casts loose and middles breeching and places selvagee straps and toggles amidships; takes off lock cover and hands it to the train-tackelman, who places it amidships; buckles on his waist-belt, (*furnished as directed*

in article 87,) provides himself with a priming wire ; puts on and secures his thumbstall ; and sees that the gear and implements for the service of the gun are all in place and ready for use, and that the men are properly equipped.

When the gun is ready for action he sees that the men take their proper positions, and reports to the Officer of the sub-division to which he belongs.

144. 2D CAPTAIN assists in casting loose and mid-dling breeching ; takes off and places amidships sight covers, selvagee straps, and toggles ; handles quoin ; provides thumbstalls, priming wires, and boring-bit, and equips himself with the first two ; clears lock-string and lays it in a loose coil round the lock, convenient for use, and buckles on his waist-belt, furnished as 1st Captain's. At Friction Carriages he removes the housing chocks. If the gun is furnished with an elevating screw, elevate the gun, that the lower half port may be let down.

145. 1ST LOADER, aided by 1st Sponger, casts loose port-laniards, removes upper half port, and passes it to the men on the left side of the gun, who lay it amidships ; lets down the lower half port. On *lower deck* casts off port-laniards and muzzle-lashing ; removes port-bar and passes it to the men at the left side of the gun, who lay it amidships ; bears out port. On all decks places hand swab and chocking quoin near the ship's side on the left side of the gun ; aids 1st Sponger in taking out tompion.

146. 2D LOADER assists in casting loose ; sees the

wads in place ; hooks double block of sidetackle to side training bolt on the left side of the gun ; and at *Friction Carriages* sees the compressor clear and in working order.

147. 1ST SPONGER casts loose port-laniards and aids 1st Loader in removing upper half ports and letting down lower ones, and on lower decks in removing the port bar, bearing out the port and taking off the muzzle-lashings ; takes out tompion and passes it to 2d Sponger, who hangs it amidships ; places chocking quoin on the right side of the gun, near the ship's side.

148. 2D SPONGER assists in casting loose ; hooks double block of sidetackle to the side training bolt, on the right side of the gun. At *Friction Carriages*, where there are two compressor-bars, attends right compressor bar.

The Spongers take down the sponges and rammers ; take off the sponge cap and hang it up out of the way ; place sponges and rammers together on the right side of the gun, heads towards the breech, in the brackets overhead on covered decks, otherwise on deck.

The SIDE-TACKLEMEN assist in casting loose ; on lower decks, aid Port-tacklemen.

149. SHELLMEN assist in casting loose, provide shot and wads, and proceed to hatchway, ready to pass loaded shell, if ordered.

150. TRAIN-TACKLEMEN lead out and hook train-tackle.

151. HANDSPIKEMEN take out the handspikes on

their respective sides, and with carriages using a quoin, each standing between his handspike and the side of the ship, place the heels of their handspikes on the steps of the carriage and under the breech of the gun, and raise it so that the quoin may be eased and the lower half port let down, or, when housed, the bed and quoin adjusted. Then each Handspikeman will lay his handspike on deck, on his own side of the gun, parallel with its axis, clear of the trucks and butt to the rear.

152. POWDERBOY repairs to his proper scuttle for his passing-box, which having received he returns and stands a little to the left and in rear of the gun, keeping the passing-box under his left arm and the cover closely pressed down with his right hand.

153. When there are *fourteen or more* men at a gun, the PORT-TACKLEMEN and SIDE-TACKLEMEN, on lower decks, lead out port-tackle falls, and assist in tricing up the port, and, when high enough, belay the fall.

154. In the temporary absence of the first Captains, Loaders, or Spongers, *when at quarters on one side*, their Seconds will take their places and perform their respective duties.

155. With a gun's crew of *ten or more* men, No. 7 will take the place of No. 5, and No. 8 of No. 6 when Nos. 5 or 6 are absent temporarily.

3. "RUN IN," (*preparatory.*)

156. Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, (and, if necessary, 5, 6,) man the Train tackle.

2d Captain ships and works Roller-handspike. Nos. 3, 4 overhaul or tend the Side-tackles.

The gun having been run in, No. 12 chokes luff of Train-tackle, assisted, if there is much motion, by No. 11.

Nos. 3, 4 place Truck-quoins in front of Trucks.

No. 6, with back square to gun, and facing over left shoulder to Sponger, takes up the Sponge, head inboard, and stands ready to hand it to 4.

No. 8, facing to the gun, and outside of 6, does the same with the Rammer.

The rest of the men go to their stations.

4. "SERVE THE VENT AND SPONGE."*

157. No 4 receives the moist Sponge from 6, right hand over, left under, sends it home, and, assisted by 3, presses it to bottom of bore ; then, turning it round two or three times in the direction which is needed to have the worm take, withdraws it, and, when out, strikes the staff several smart taps under the muzzle, then hands it back to 6, who lays it on the deck or lodges it overhead on the hooks, if they are provided. No. 10 examines and clears sponge head and worm.

Gun Captain stops the Vent, and after the Sponge is withdrawn serves the vent with his priming wire and again closes it.

No. 8 hands Rammer to 4 as soon as the Sponge is

* See notes on this command and the succeeding one, "LOAD," for further important details.

taken from him by 6. Should 4 observe that the Gun Captain neglected to serve the vent, he is to call his attention to it.

No. 3 stands ready with Charge he has taken from Powderman.

No. 5, assisted by Shell-man, opens Shell-box, disengages the Shell, and has it in readiness to pass to No. 3.

5. "LOAD."

158. No. 3 places Charge in muzzle, seam from the Vent, small end in, and pushes it well into the Bore.

No. 4 stands ready with the Rammer, enters it into the muzzle and pushes the Charge steadily to the bottom of the Bore, which will be shown by the mark on the rammer handle; 3 assists with one hand, and the charge is *on no account to be struck*.

While 4 withdraws the Rammer, 3 is to receive the Shell from 5, lift and enter it, sabot first, into muzzle, fuze out, as soon as the rammer is clear thereof.

As the shell lies just fair with muzzle, 3 removes cap from Fuze, which is to be passed along to the Gun Captain, and pushes the Shell into the Bore.

No. 4 enters Rammer, and, assisted by 3, pushes in the Shell until the mark on handle shows it to be in place. It is most strictly forbidden to strike the Shell with the Rammer.

No. 6 takes Rammer from 4 and lays it down.

Whilst this has been doing, the preparation for the next order has been proceeding, thus:

2d Captain ships Roller-handspike. Nos. 7, 9, 11, 13, 15,—8, 10, 12, 14, 16 take hold of Side tackles; Gun Captain feels if Vent is clear.

Action.

Nos. 5, 6 assist at Side-tackles.

Nos. 3, 4 attend Truck-quoins and keep the Breeching clear of Fore-trucks.

No. 12, assisted in heavy rolling of lee guns by 11, prepares to tend Train-tackle. If necessary with a round turn round all parts of the fall.

6. "RUN OUT."

159. The execution of this order is to be controlled by the gun being to windward or to leeward, and also by the nature of the Roll.

To *leeward*, and with much motion, the cannon will rush out violently unless prevented; therefore 11 assists 12 at the Train-tackle; 7, 9, 11, 13, 15, and 8, 10, 12, 14, 16 start the gun cautiously.

2d Captain heaves up on Roller-handspike, but is careful to let down the Carriage if it begins to start out rapidly; it may even be advisable not to use the Roller-handspike at all.

Nos. 3, 4 remove Truck-quoins and tend breeching.

Action.

If to *windward*, 2d Captain heaves up Carriage fully on Roller-handspike.

Nos. 5 and 6 assist at Side-tackles.

No. 12 only tends Train-tackle if the Roll should need it; otherwise he overhauls it and assists at Side-tackles.

Nos. 3, 4 remove Truck-quoins, and keep Breeching from fouling the Fore-trucks; 7, 9, 11, 13, 15, and 8, 10, 12, 14, 16 set taut the Side-tackles.

When the gun is out the 2d Captain swivels the Roller-handspike for training, or removes it altogether if the Handspike alone be preferred for this operation.

Nos. 5, 6 choke luffs of Side-tackles, while 3, 4 place Truck-quoins in rear of trucks, *if the movement of the ship requires it*, otherwise the Side-tackles will be retained in hand.

If the training is to be sharp, the proper Side-tackle will be hooked to the further eye-bolt inside; 12 unhooks the Train-tackle, and hooks it also to the proper eye-bolt in deck.

7. "PRIME."

160. Gun Captain again *makes sure* that the Vent is clear, and, in *so doing*, lets down his wire quickly into the charge.

He inserts a Primer, and turns down the Hammer upon it.

Meanwhile 9, 10 take up handspikes and place themselves at rear of bracket conveniently to heave forward or aft.

In sharp training Nos. 13, 14 assist them.

Nos. 3, 5, 7, 11, 13, 15, and 4, 6, 8, 12, 14, 16 man Side-tackles.

8. "AIM."

161. Gun Captain adjusts or verifies Sliding Bar of Rear Sight to proper distance given by the Officer of Division, and falls back so as to be clear of the recoil, lanyard in hand, face to the Port, standing *directly in the rear of the gun*, with his eye ranging over the sights, and keeping in view the water-line of the opposing ship, trains the gun by voice or sign.

No. 6 throws back the Hammer, and takes hold of lever of Elevating Screw. (If Roller-handspike is not used in training, 2d Captain performs this.)

At word "Muzzle to right" or "left," 3, 5, 7, 11, 13, 15, or 4, 6, 8, 12, 14, 16 haul on the proper Side-tackle, and 9, 10 heave correspondingly on handspikes. Nos. 3 and 4 keep their eyes on handspikemen opposite to them, to give the time to the other Nos. for hauling on the fall.

No. 6 (or 2d Captain) Elevates or Depresses as directed.

Action.

2d Captain unships the Roller-handspike if it has been used in training. 9, 10 lay down handspikes.

Nos. 3, 4 overhaul Side-tackles *to mark*, unless the motion does not admit of it.

No. 12 overhauls or holds up Train-tackle.

Nos. 7, 8 remove quoins from Trucks.

Men to their stations.

9. "READY—FIRE."

162. The Gun Captain, standing as already placed, waits patiently, but sharply, for the coincidence of the sights upon the object, which, if a ship, is *always the water-line*. When a correction of elevation or of direction is required, he repeats such of the previous orders as may be required; and these are to be re-executed accordingly.

If the gun is to leeward, the men stand ready to take hold of the Train-tackle and jerk the cannon into a taut breeching.

When sure of his aim the Gun Captain, who has held the lock lanyard *just* taut, draws it promptly and firmly, bearing in mind that in no case is he to attempt moving from his post.

The 2d Captain stands ready with a primer, and, in the case of failure, throws back the hammer and inserts another. If necessary, serves the Vent.

Action.

Instantly with the explosion, 11, 12 jerk away the parts of the train-tackle, or hook it if it has been unhooked.

Nos. 3, 4 place quoins in front of trucks.

When the gun is not in to a taut breeching, the 2d Captain ships the Roller-handspike.

Nos. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 take hold quickly of Train-tackle, and run in to a taut breeching.

When in, 8, 4 move up the Truck-quoins, 12 chokes luff of Train-tackle.

Gun Captain puts back the hammer and coils up lan-
iard.

No. 6 takes up Sponge, and the exercise proceeds as already directed.

If necessary, No. 2 levels the gun for loading, and lays it fair for running out.

163. N. B. The breechings of IX-in. guns are to be so fitted that the face of muzzle when in shall be 18 inches from inner face of side, for two reasons :

To prevent the gun from returning to the port, and to give room for the handling of such large shells.

17 men are a proper number for working a IX-in. under any circumstances.

Rammer handles are to be marked for place of charge and of shell.

Side and Train-tackles are also to be marked to the proper overhaul, so as to avoid slack rope.

Breast sweeps are useful at lower sill of port, for training more than a point.

10. "SECURE."

164. The Powderboy returns the spare powder and the passing-boxes to the magazine. The Shellmen return the shells and empty shell-boxes, if any remain on deck, to the shell room.

The 1st Captain directs the gun to be laid square in the middle of the port.

When the guns are to be secured without being housed the 1st Loader and 1st Sponger place the chocking-quoins square up against the rear part of the front trucks and put in the tompion. The Handspikemen, if there is a quoin, free the quoin and lower the breech, the 2d Captain handling the quoin. When the gun is fitted with an elevating screw this operation is performed by the 2d Captain alone, who handles the screw.

The 1st Captain, assisted by the 2d Captain, hauls the breeching through the jaws of the cascable to the left side of the gun, forming with the bight a turn over the breech and 1st reinforce, taking care to keep the breeching well clear of the elevating screw to prevent chafe, and securing the parts on each side with selvagees; or if this should interfere with the breech-sight, by crossing the breeching at the side and securing it with selvagee straps and toggles.

The 1st Loader and 1st Sponger haul up and secure the lower half-ports. The 1st Captain puts in the vent plug, lays the hammer of the lock in its place, and the lock-string in a coil around it. The 2d Captain takes the lock-cover from the Train-tackelman and secures it over the lock, and in like manner covers the breech and reinforce sights; [and at Friction Carriages puts the housing-chock into the slot in the rear of the gun, and raises the training trucks clear of the deck, by means of a chock under the slide.]

The men at the side-tackles unhook the double blocks from the side training bolts and hand them to the 1st

Loader and 1st Sponger, who hook them to the eye-bolts at the sides of the port. The men on both sides haul them taut and stop the parts of the tackles together, with knittles provided by the Quarter Gunner, and then expend the remainder of the falls by passing them around the breech of the gun, above the jaws of the cascable, and stopping the bights alternately to the eye-bolts* on each side of the port until expended.

The Train-tacklemen hook the train-tackle to the side-tackle bolts on each side of the port, the double block on the left side, haul the tackle taut, expend the end round the breech, and stop the parts in with the side-tackles.

The 1st Captain then directs the Handspikemen, or if the screw is used, the 2d Captain, to raise the breech so as to level the gun and bring all parts of the tackles and breeching taut.

The 1st Loader and 1st Sponger put in and secure the upper half-ports, if directed, and the 1st Loader swabs the deck to collect any loose powder which may have been scattered on it.

The several persons who provided the arms and implements used in the exercise, return them to their proper places, or to the persons appointed to take charge of them, care being taken that the small arms are unloaded before they are sent below, unless otherwise directed by the Captain.

* Should hook-bolts be substituted for the eye-bolts now in use for the side-tackles, as vessels are built or repaired, the turns of the fall will be taken round the hooks in securing the gun.

Housing Lower Deck Guns.

165. *If the lower deck guns are to be housed, the 1st Captain directs the gun to be laid square in the middle of the port, and run it to a taut breeching, and if loaded, the load to be drawn.* The 1st Loader and 1st Sponger place the housing-chocks before the front trucks.

The gun is then run close up against the housing-chocks, and the chocking-quoins are placed square up behind the rear trucks.

The Handspikemen raise the breech to free the quoin; the 2d Captain withdraws it and the bed; the Handspikemen lower the breech upon the axletree, so that in case the gun should break adrift, the muzzle will take the upper port sill, and the Port-tacklemen lower the port-lid.

The 2d Loader and 1st Shellman bring the port bar to the 1st Loader and 1st Sponger, who put it in place across the port, hook the port-hooks in the ring-bolts in the port-lids, and drive in the keys until the port is perfectly closed.

The men on both sides shift the side-tackles from the training-bolts to the side-tackle bolts, haul them taut, and expend the ends between the blocks. The 1st Loader and 1st Sponger pass the frapping lashing round both parts of the breeching, in front of the brackets, and with the assistance of the men nearest them, bowse it well taut; and secure the muzzle by placing the grommet over it, and the housing hook-bolt, and by frapping

the two parts together with the lashing. When the housing bolt is an eye-bolt, a toggle will be necessary to keep the grommet in its place.

In moderate weather the train-tackle is unhooked from the deck, and made up and stopped along the side-tackle, on the forward side of the gun. In bad weather it is kept hooked, bowsed taut, and the end expended through the ring-bolt and round the arms of the rear axle.

The manner of housing guns, mounted on truck carriages, on other decks, in bad weather, does not vary materially from that just described, excepting that the upper half-ports and the *port bucklers* are put in and secured.

When there are no housing-chocks, the ordinary chocking-quoins may be used as such. It will be an additional security to take off the rear trucks, and to tighten the muzzle lashing by raising the breech.

In housing broadside guns mounted on *Friction Carriages*, the gun is first run in and the housing-chock dropped into the slot in front of the gun, which is then run out hard upon the chock, and the compressor tightened. The gun and implements are secured as at other guns, the training trucks being raised clear of the deck by means of a chock under the slide.

General Remarks.

166. When the individuals of the guns' crews have become well acquainted with, and expert in the performance of their several special duties, they are to be

successively transferred, temporarily, to the performance of the duties of some other station, until each man shall have become acquainted with the special duties of every station at the gun.

In exercising, each man of a gun's crew in the duties of all the other men of that crew besides his own, it is to be done thus:

The system supposes that, beginning with the 2d Captain to take the place of the 1st Captain, the men are to be called to perform the duties of the latter in a regular succession agreeably to the way they are placed at the gun; *i. e.*, after the 2d Captain the 2d Handspikeman is to do the duties of 1st Captain; after the 2d Handspikeman, the 2d Train-tacklemán, and so on all round the gun. Each man is to fleet his position one remove or place, in a direction "with the sun," so that instead of the interchange of duties being confined to two individuals only, it is to extend to the whole gun's crew. Thus, for instance, when the 2d Captain is called upon to do the duties of 1st Captain, the latter, by moving one place "with the sun," becomes the 1st Handspikeman, the 1st Handspikeman becomes the 1st Train-tacklemán, the 1st Train-tacklemán the 1st Port-tacklemán, and so on all around the gun throughout the whole crew, the person at the muzzle of the gun on its left side crossing over and taking the place of the one at the muzzle on the right side. Next in order, the 2d Handspikeman is required to take the place of the 1st Captain, then the 2d Captain becomes 1st Handspikeman, the 1st Captain

the 1st Train-tackleman, the 2d Train-tackleman the 2d Captain, and so on throughout.

If it should be desired to take, at first, a man from the middle of the crew of the gun, or even still further towards the muzzle, to do the duties of 1st Captain, then it must be done under the supposition that all the men preceding him in the order above mentioned have already been exercised in those duties, and the men are then to take their stands accordingly.

After the guns' crews have been well trained by giving the words of command, it will be expedient to exercise them without giving the several detailed commands, by directing them to "load and fire." At this command, the different individuals should, each in proper order of time, silently perform his prescribed duties of sponging, loading, running out, training, and pointing, the Captain of the gun regulating the elevation and depression, by raising or lowering his hand, and by holding it horizontally and steady when the gun is "well;" and in pointing, by moving his hand to "right" or "left" as the gun requires to be trained, and by bringing it down to his side when it is "well." Before firing, he is to throw his hand well up as a signal for the men to "drop tackles," and is to give the word "fire" when he pulls the lockstring.

When casualties occur at the guns, the Captain of the gun will order "close up," and then equalize the crew on each side. If the Powderman is disabled, the highest number takes his place.

167. Whenever the crew of a gun becomes so greatly reduced in action that men enough are not left to work the piece, it may be fired while partially run in. In such case, however, the breeching should be frapped forward of the carriage, or otherwise arranged, so as to keep the muzzle outside of the port; the side-tackles should be hauled well taut and secured; the chocking-quoins placed square up against the after part of the rear trucks; the train-tackle hauled taut, and well secured, and wet swabs placed up against the forward part of the front trucks, and sprinkled with sand or ashes. The greatest possible care should be taken to guard against accident from fire, and minimum charges of powder used.

It must be apparent to every officer that both the rapidity and the accuracy of fire to be obtained from guns in vessels at sea, must depend, in a great degree, upon the care which may be taken to explain to the men the best mode of performing their respective parts of the exercise, and the particular object for which each part is intended, and especially on such frequency of exercise and target firing as will make the men perfectly familiar with their prescribed duties. The importance of this instruction, which may decide whether an action shall result in victory or defeat, will, it is hoped, insure due attention to it from all officers, and especially from the officers of divisions at quarters.

THE GUNS ON ONE SIDE BEING MANNED,
TO CHANGE SIDES,
OR BOTH SIDES BEING MANNED,
TO MAN ONE SIDE ONLY;
COMMAND.

“MAN THE STARBOARD (OR PORT) GUNS.”

168. Whenever this or any other order is given which requires all the men suddenly to leave the gun which they are working, they are not to do so until it is properly loaded, and well secured by hauling taut the side and train tackles, and hitching their falls around the straps of the single blocks; nor on lower decks of ships-of-the-line till the ports are down and secured by their laniards. A strict compliance with this injunction is indispensable to guard against excessive or imperfect loading, and other accidents.

When these precautions have been duly taken, the men will shift over in obedience to the command.

EXERCISE OF BROADSIDE GUNS

On both Sides at Once by Manning Alternate Guns with Full Crews.

In the event of being required to fight both sides, it is generally conceded that a more effective fire is maintained by handling alternate guns with full crews.

In this case the preparatory order will be given :

“ SILENCE ! MAN BOTH SIDES, EVERY OTHER GUN WITH
FULL CREWS.”

Upon which the guns' crews of the guns of the *starboard watch* will man the *odd numbered* guns on the *starboard* side, and the guns' crews of the *port watch* will man the *even numbered* guns on the *port side*, and the exercise will be the same as prescribed for “broadside guns on one side only.”

Manning all the Guns.

GENERAL REMARKS.

169. The object of the following arrangement is to enable each gun's crew to work together and fire alternately a pair of guns on the same side of the deck. Experience, however, shows that this can only be continued with effect for three or four rounds.

When the after gun on a deck has an odd number, that and its opposite are to constitute a pair, and the crew is to be distributed between them and work them accordingly.

170. When the command is given to man both sides, the guns' crews of the *starboard watch* will man the *starboard* guns, with their first parts at the *odd*, and their second parts at the *even* numbered guns ; and the guns' crews of the *port watch*, the *port* guns, with their first parts at the *even*, and their second parts at the *odd* numbered guns.

171. *When the guns are cast loose and provided, 1st and 2d Captains, Spongers, and Loaders are to remain at their respective guns, the "Shifting men" changing, at the order to do so, from one gun to the other of the pair. Captains, Loaders, and Spongers are to endeavor to load their respective guns, ready for running out, while the "Shifting men" are employed at the gun about to be fired. The same Powderboy is to supply both guns worked by the gun's crew to which he belongs.*

172. Diagrams C and D exhibit the places of the men at the guns at the commencement of the exercise in working both sides at once.

The six permanent men of the gun's crew are distinguished by Arabic, and the "Shifting men" by Roman numerals.

Nos. 3 and 5, 4 and 6, assist at the side-tackles of their respective guns, while at their several stations.

173. If the gun's crew consist of 14 men, Nos. VIII, XIV, and X work the right, and XIII, XI, and IX the left side-tackles of their pair of guns.

No. XII attends train-tackle in running out and in, and No. VII passes shot and shell for his pair of guns.

174. If there be 16 men at a gun, the arrangement will be the same, with the addition that No. XVI works at the right and XV at the left side-tackle.

175. With a gun's crew of ten men, Nos. VIII and X work the right, and No. IX, assisted by Nos. 1 or 2, the left side-tackles of their pair of guns.

No VII supplies shot or shell, and No. X also attends

the train-tackle, in running out and in, of his pair of guns.

176. With a gun's crew of eight men, No. VII supplies shot or shell, and works at the left side-tackles, and No. VIII attends the train-tackles, and works at the right side-tackles of the guns of their pair.

When little or no training is required, the side-tackles should be hooked at the sides of the ports.

177. If there be but 6 men at a gun there can be no "Shifting men;" consequently, to man both sides, in this case, Marines or other available men must be taken to supply the deficiency.

178. At Friction Carriages the Loaders attend compressors. No. VIII attends the train-tackle of both guns of a pair.

179. Luffs of side and train-tackles of all guns run in are to be chocked, or hitched round straps of single-blocks, and chocking-quoins used when necessary.

180. In case the guns' crews should be so reduced, from any cause, as to render it impracticable to fight all the guns alternately, as just described, the remaining men must be concentrated so as to work *efficiently* as many guns as their numbers will permit.

181. The exercise begins under the supposition that the guns commanded by 1st Captains are loaded and run out, and those commanded by 2d Captains are run in and loaded. The orders are first addressed to the 1st Captains, because the "Shifting men" are supposed to be with them, ready to run out if required; the order

of the commands, however, may be changed to suit any other state of the case.

Preparatory Commands and Duties.

182. 1st. "SILENCE! MAN BOTH SIDES!"

The guns' crews will man the guns as directed in article 233.

2d. "CAST LOOSE AND PROVIDE!"

183. The *Captain* at the gun, with the *Train-tacklem*an to aid him in taking off the covers of the lock and sights, and placing them and the straps and toggles amidships, middling breeching and handling quoin, is to attend to the same duties as those prescribed for both 1st and 2d Captains when providing and working the guns on one side only.

The *Sponger* and the *Loader*, aided respectively by the *Side-tacklemen* and the *Handspikemen*, are to attend to the same preparatory duties as are prescribed for both *Loaders* and both *Spongers* when providing and working one side only.

The *Shellman*, in addition to his ordinary duties, handles the left handspike in freeing the quoin.

The *Side-tacklem*an provides sand and water, sprinkles and sands the deck if directed, and assists the *Sponger*.

The *Train-tacklem*an hooks train-tackle.

The *Fireman* provides fire-buckets and lanterns for both guns of the pair.

The *Handspikeman*, aided by the *Shellman*, does what

is required of both Handspikemen when exercising one side only.

EXERCISE.

184. Words of Command.

1st CAPTAINS—"PRIME!"

1st CAPTAINS—"AIM!"

1st CAPTAINS—"FIRE!"

"SHIFTING MEN—CHANGE!"

1st CAPTAINS,

2d CAPTAINS,

"SERVE VENT AND SPONGE!" "RUN OUT AND PRIME!"

1st CAPTAINS,

2d CAPTAINS,

"LOAD!"

"AIM!"

2d CAPTAINS,

"FIRE!"

"SHIFTING MEN—CHANGE!"

185. To continue the exercise the orders will be the same, applying to 1st Captains those which were given to 2d Captains, and reciprocally.

186. After exercising the men sufficiently in the order of commands just described, it will be well, by way of transition, and before giving the order to Captains of guns to continue the exercise, to confine it for a while to *three* commands, as follows :

FIRST.

1st CAPTAINS,

2d CAPTAINS,

"SPONGE AND LOAD!"

"AIM AND FIRE!"

SECOND.

“SHIFTING MEN—CHANGE!”

THIRD.

1st CAPTAINS,

“AIM AND FIRE!”

2d CAPTAINS,

“SPONGE AND LOAD!”

Observations on the Execution of the Commands.

187. The order “*Prime!*” is executed as in the exercise of guns on one side only.

188. The order “*Aim!*” as in the exercise of one side, except attending the train-tackle, which is to be done by the 2d Train-tackleman when the gun’s crew consists of more than 10 men, by the 2d Handspikeman when the gun’s crew consists of but 10 men, and by the 2d Shotman when the gun’s crew consists of less than 10 men, and excepting, also, that the Train-tackleman is in all cases to attend to the quoin or screw, in place of the 2d Captain.

189. The order “*Fire!*” the same as in fighting one side only.

190. At the order “*Shifting Men—Change!*” the Shifting men go promptly from one gun of a pair to the other, and distribute themselves at the side and train-tackles, the left Handspikeman first shipping his hand-spike in the training loop, ready to give the gun the proper direction in running out.

191. “*Serve Vent and Sponge!*” as in exercising one side, except that the sponging and loading are to be

done by the Sponger and Loader stationed at the gun, alone; the Captain is to pass the sponge and rammer to the Sponger, and the Sponger is to return them to the deck. The Handspikeman examines and clears the sponge-head and worm.

192. "*Run out and Prime!*" as in exercising one side, except that the *left handspike* alone is to be used By the Captain of the gun, and that the Sponger and Loader at the gun are to do the duties required of the 1st Sponger and 1st Loader in fighting one side.

193. "*Load with Cartridge!*" as in the exercise of one side, except for 1st Sponger and 1st Loader read Sponger and Loader.

194. "*Load with Shot!*" the same as in exercising one side, except that the Shellman passes shot and wad to the Loader, and for 1st Sponger and 1st Loader read Sponger and Loader, and that the Sponger returns the rammer to the deck instead of to the 2d Sponger.

195. "*Load with Shell!*" for 2d Loader read Shellman, for 1st Loader read Loader, and for 1st Sponger read Sponger.

The Shellman covers the box again, goes for another shell, and sends the empty box below.

For 1st Sponger and 1st Loader read Sponger and Loader, and omit the paragraph relating to Handspikemen.

196. When the order to "*Secure!*" is given, and the guns are run out, the *Shifting* men divide into 1st and 2d parts and repair to the guns of their respective 1st

and 2d Captains. The order "SECURE!" is then to be executed as in the exercise of one side, except for 1st Sponger and 1st Loader, throughout, read Sponger and Loader; that the Handspikeman is to be aided by the Shellman in freeing the quoin and lowering the breech, and at the proper time in raising the breech and leveling the gun; that the Train-tackleman is to handle the quoin or screw; that the Captain in hauling the breeching through the jaws of the cascable, is to be assisted by the Train-tackleman, who is to put on the lock and sight covers, (and in Friction carriages, the housing-chock in place,) and hook train-tackle to side-tackle bolts; and that the Side-tackleman on the side of the Loader, and the Shellman on the side of the Sponger, are to unhook the double-blocks from the side-training bolts and hand them to the Sponger and Loader.

197. *If the lower-deck guns are to be housed, it will be done as in the exercise of one side, except that for 1st Sponger and 1st Loader, throughout, read Sponger and Loader; and that in raising the breech to free the quoin, and in lowering the breech upon the axle-tree, the Handspikeman is to be aided by the Shellman, the Train-tackleman withdrawing the quoin and bed.*

The Port-tackleman lowers the port-lid and brings the port-bar to the Sponger and Loader.

QUICK FIRING.

198. The service of the guns consists, essentially, of two distinct parts, *pointing* and *loading*. The first of

these, *pointing*, cannot be performed too carefully and methodically, and requires extreme coolness and attention on the part of the Captain of the gun; *loading*, on the contrary, cannot be executed with too much rapidity, provided neither the safety of the gun nor of its crew be compromised.

It is clear that if two hostile vessels meet equally matched in all the ordinary points of equipment and preparation, and manned by crews equally skilled in gunnery, the advantage will be in favor of the ship that loads quickest; and should it happen that nicety of aim becomes a matter of secondary importance, in consequence of the closeness of the action, then, evidently, rapidity of fire will determine the affair.

These considerations appear decisive, and every care should be taken, in the instruction of guns' crews, that pointing be executed with deliberation, care, and method, and loading with all possible despatch. In order, therefore, to insure the great advantage of rapid firing, officers are enjoined frequently to exercise the crews in setting the cartridge, shot, and wad home together, in one motion, of such guns as may be loaded in this manner, without inconvenience. This is the case with all the guns, chambered as well as unchambered, excepting the 8-inch shell-gun of 63 cwt. of patterns earlier than 1851; it is not recommended, however, to practice simultaneous loading with guns of higher calibre, such as IX-inch and upwards, as nothing will be gained by it in point of time.

To prevent the shot from rolling on the tie of the cartridge and jamming it, the end of the cartridge-bag, outside of the tie, should be shortened as much as security will permit, unless it has been specially prepared for this use, by stitching back the end in the form of a cockade.

With the view of affording the Loader a certain and independent means of knowing when the whole load is really home, the handle of the rammer should have a mark upon it, easily distinguishable either by day or night, and this should be suited to the "ordinary firing" charge of powder, due allowance being made for the others.

COMMAND.

"LOAD IN ONE MOTION!"

199. The Loader receives the cartridge and puts it in the gun, as already described ; he also receives the shell or shot and wad and introduces them accordingly.

As soon as the *whole charge* has been introduced, the Sponger and Loader together thrust it down smartly with the rammer, as in ordinary loading. When *home*, the men run the gun out as quickly as possible ; the Captain of the gun clears the vent, primes in running out, points and fires in the usual manner, but as rapidly as is consistent with a good aim, taking care that the muzzle is clear of the port sill, and on lower-decks that the port is triced up clear of the explosion.

Shifting Breechings in Action.

COMMAND.

"SPONGE, LOAD, AND SHIFT BREECHING!"

200. Supposing the gun's crew to be reduced to six men and the Powderboy, that being the least number required to perform the evolution, and the gun to be discharged and run in. The 1st Captain hauls taut the Train-tackle and chokes the luff, and the 1st Loader and 1st Sponger place the chocking-quoins forward of the front trucks, and proceed to sponge and load the gun in the usual manner. The 2d Sponger and 2d Loader haul taut side-tackles and choke luffs, or if rolling deep, hitch the falls round the straps of the blocks, and then unshackle the old breeching and shackle the new, which is to be brought to the gun by the 2d Captain.

The 1st Captain removes the old breeching from, and places and secures the bight of the new one in the jaws of the cascable, after the gun is sponged. The 2d Captain passes the old breeching amidships, and the men resume their usual duties at the gun.

When there are more than six men at the gun, the 2d Sponger and 2d Loader, after securing the side-tackle falls, will assist to load the gun, and the additional men will assist in unshackling the old and shackling the new breeching, but one of these will do all the duties just assigned to the 1st Captain, so as not to interfere with his ordinary duties in loading.

Shifting Trucks.

201. The operation of shifting a truck can only be required when the gun is "*run in*" after firing. *At the order to shift any one of the trucks that may be designated :*

With the Marsilly carriage.—Heave up with the roller handspike under the end of the bracket on the side on which the truck is to be removed ; Handspikemen pass inside the breeching and place their handspikes under the fore axletree as near the truck as possible, and, assisted by 5 and 6, lift the gun while the Shellman removes the old truck and Side-tackleman puts on new one.

With the ordinary carriage.—To shift a *rear* truck, Handspikemen lift under the rear axletree. To shift a *front* truck the rear truck on the opposite side should first be taken off, then Handspikemen lift under the fore axletree.

EXERCISE OF PIVOT GUNS.

XI-INCH SHELL GUN.

(For Example.)

202. Arranged to traverse on circles fitted with *Bossed Sockets* for pivoting, and with clevis-bolts and sockets for housing.

EQUIPMENTS AND IMPLEMENTS.

| Articles | Where they are to be put when the gun is secured. |
|--|---|
| Carriage and slide complete, with elevating screw and pivot bolts. | In place. |
| Two front roller levers..... | } Becketted to brackets. |
| Two rear do. | |
| Two levers for training and shifting trucks..... | |
| Two in-tackles..... | Hooked in place. |
| Two out-tackles..... | Do. do. |
| Two shifting-tackles..... | Made up on slide. |
| Two training-tackles..... | Do. do. |
| Breeching..... | In place. |
| Preventer..... | Do. |
| Lashings for securing gun..... | Do. |
| Tompions with wad and lanlard... | Do. |
| Sponge and cap | } Becketted to beams between decks, or inside the brackets. |
| Rammer..... | |
| Lock, with string..... | } In place. |
| Vent plug. | |
| Lock-cover and strap..... | In place on gun. |
| Breech-sight and cover..... | Do. do. |
| Reinforce sight and cover..... | Do. do. |
| Trunnion-sight..... | In box between decks. |
| Priming-wires..... | } Inside brackets. |
| Boring-bits..... | |
| Water buckets..... | Hold. |
| Hand-swabs..... | Breast of carriage. |
| Selvagee-wads | Do. do. |
| Battle-axes, as allowed (<i>Art. 101</i>).. | On breast transom. |
| Two transporting axes and trucks. | In storeroom, at hand. |
| One shell in box..... | On slide. |
| Shell-bearer..... | Do. |
| Rail transom chocks*..... | Under rails. |

* These should always be kept under the centre transom when the carriage is not in use; also in firing at high angles of elevation to relieve the rails of the shock.

Stations and Gun Numbers.

203. The following are to be the gun numbers and stations for a gun's crew of twenty-five, including the Powderman, the XI-inch shell gun being taken as an example :

| Left side. | Gun No. | | Right side. |
|--------------------------|---------|----|------------------------|
| First Loader..... | 8 | 4 | First Sponger. |
| Second Loader..... | 5 | 6 | Second Sponger. |
| First Shellman..... | 7 | 8 | Second Shellman. |
| First Front Leverman ... | 9 | 10 | Second Front Leverman. |
| First Compressman..... | 13 | 14 | Second Compressman. |
| First Rear Leverman..... | 11 | 12 | Second Rear Leverman. |
| Tacklemen | 17 | 18 | Tacklemen. |
| | 19 | 20 | |
| | 21 | 22 | |
| | 23 | 24 | |
| First Train Leverman.... | 15 | 16 | Second Train Leverman. |
| First Captain..... | 1 | 2 | Second Captain. |
| Powderman..... | 25 | | |

To reduce from 24 men and Powderman to 20, omit four highest numbers.

To reduce from 20 men and Powderman to 16 men and Powderman, omit four next highest numbers.

To reduce from 16 men and Powderman to 12 men and Powderboy, omit four highest numbers ; 8, 9, and 10 become Pikemen, 11 and 12 Compressmen and Train-levermen, in addition to other duties.

To reduce from 12 men and boy to 10 men and boy, omit two highest numbers ; 5 becomes Pikeman, 7 be-

comes Fireman, 9 and 10 Compressor and Train-levermen, in addition to other duties.

EXERCISE FOR HEAVY GUNS.

Mounted on Pivot Carriages.

XI-INCH SHELL GUN. (*As an Example.*)

204. The gun is supposed to be secured amidships, fore and aft, over the housing pivot, and not loaded.

The exercise will proceed in conformity to the following words of command, viz :

1. "SILENCE! CAST LOOSE AND PROVIDE!"
2. "RUN IN?"
3. "SHIFT PIVOT!" To the *right* (or *left*!)
4. "SERVE VENT AND SPONGE!"
5. "LOAD!"
6. "RUN OUT!"
7. "PRIME!"
8. "AIM!"
9. "READY—FIRE!"
10. "SHIFT TO HOUSING PIVOT AND SECURE!"

N. B.—It is always to be understood that when any of their respective duties under one command are executed, the men will at once proceed to prepare for those which follow next in order. The exercise must be considered as a whole, though the details are necessarily divided under the several words of command.

EXERCISE OF PIVOT XI-IN. CANNON.

Gun secured for sea amidships.

1. "SILENCE! CAST LOOSE AND PROVIDE!"

205. No 1, Commands; sees his gun cleared and cast loose; circles cleared and swept; tackles hooked; levers shipped; lock and sights in place; elevating apparatus, pivot-bolts, and compressors in working order; takes off lock-cover and hands it to 23, who lays it clear of circle; provides himself with waist-belt and primers, priming-wire, boring-bit, and thumbstall; and sees that all the gear and implements are ready for use, and the men at their respective stations.

No 2. Takes off sight-covers and hands them to 22, who lays them clear of circle; removes rail-chocks, and assists in casting loose. He provides waist-belt and primers, and sees that the men on his side of the gun execute promptly their several duties:

Cast Loose.

| | | | | |
|-----------------------------|---|---|-------|--------------------|
| Clear away the Bulwarks | . | . | . | 15.16.17.18.23.24. |
| Lashings of Gun—Adrift | . | . | . | 3.4.11.12. |
| In-tackles—Cast loose | . | . | . | 15.16. |
| Out-tackles—Cast loose. | | | Clear | |
| Gun Circle | . | . | . | 13.14. |
| Training Tackles—Cast loose | . | . | . | 19.20.21.22.23.24. |
| Implements | . | . | . | Gr. Gunner, |
| Powder | . | . | . | 25. |
| Shells, Shell-ladle, etc. | . | . | . | 7.8. |

| | | | | |
|------------------------------|---|-----------|--|--------|
| Sponge | } | Take down | . . . | 5.6. |
| Rammer | | | | |
| Fore Carriage Levers, Ship * | | | . . . | 9.10. |
| Rear Carriage Levers—Ship | | | . . . | 11.12. |
| Slide-levers—Ship forward | | | . . . | 15.16. |
| Sight-Covers—Take off. | | | 2d <i>Capt. and</i> <i>hands to 22.</i> | |
| Buckets of Water †—Fill | } | | . . . | 5.6. |
| Wet Swabs—Bring | | | | |
| Outer Train-tackles hook | } | as | to Deck | 21.22. |
| Shifting Tackles | | | to Slide | 23.24. |

* When the trucks are to be brought into play, the levers should be shipped on their axle squares so as to heave upwards, past the centre, and rest against the wood of the Carriage or Slide; otherwise they must be kept in place by hand, or by a pin, neither of which entirely secures the Levers from flying back and doing mischief. If hove down, they are apt to interfere with the Tackles.

In order to ship the levers expeditiously on the proper square, both are to be marked with a Cold Chisel.

The Fore Carriage Levers require the effort of two men at each, as the weight of the Gun has most bearing there; each of the other levers is readily worked by one man.

† Principally to moisten the Sponge, which ought never to be omitted, as there is nothing so effectual in extinguishing any fragments that might remain burning in the Bore, and cause accidental explosion in loading, particularly in blank firing. It is a mistake to suppose that this practice increases the foulness of the Bore; on the contrary, it prevents it from hardening and accumulating, as long experience has shown. Sometimes it is convenient for the Spongers to dip the Sponge alongside, and they soon acquire the habit. Superfluous moisture is easily gotten rid of by twirling the Sponge at the handle.

| | | |
|-----------------------------|----------------------|--------|
| Inner Train-tackle * hook | { to Deck . | 17.18. |
| | { to Slide . | 19.20. |
| Attend Compressors | | 13.14. |
| Man In-tackles | { 11.15.17.19.21.23. | |
| | { 12.16.18.20.22.24. | |
| Man Carriage-levers | { Fore. 9.10. | |
| | { Rear. 11.12. | |

206. Stand By to Run In.

| | |
|---|----------------------|
| Ease Compressors † and go to In-tackles | 13.14. |
| Up Carriage-levers † | { Fore. 3.9. & 4.10. |
| | { Rear. 11.12. |
| Tend Out-tackles | 5.6. |

2. "RUN IN."†

| | |
|----------------------------|-------------------------|
| Haul on In-tackles | { 11.13.15.17.19.21.23. |
| | { 12.14.16.18.20.22.24. |

* Were it practicable to hook a tackle so that it would move the gun, even from amidships to the port without being shifted, or were it prudent to leave the gun free while shifting the tackle, there would be no need of a second tackle. But it is not possible, in pivoting, to exert direct action for more than the eighth of a circle by one position of a tackle, and it is absolutely dangerous at Sea to leave the Slide unconfined for an instant. When, therefore, the Outer-tackle is a block, the second tackle must be hooked and set taut.

† These orders are to be executed in quick succession, so as to be nearly simultaneous; that is, the compression is first relieved by backing its lever, upon which the Fore-levermen instantly bring the carriage on its trucks, and the gun is run back by the In-tackles, the Out-tackles being eased gradually so as to check any violent movement; for the trucks being fitted with friction rollers, allow the heavy piece to move suddenly and rapidly.

| | |
|--|------------------------------------|
| Out-tackle block—Unhook from Slide, to leave room } for hooking Inner Training-tackle } | 5.6. |
| Down Carriage-levers { | Fore. 3.9. & 4.10. Rear. 11.12. |
| Tauten Compressors | 13.14. |

207. Stand By to Pivot.

| | |
|--------------------------------|--------|
| Draw Fore Pivot-bolt | 8.4. |
| Up Fore Slide-levers | 15.16. |
| 5 or 6 places Shifting-chock. | |

| | |
|--|---|
| Man Outer Train-tackle | { 3.11.5. 9.13.15.17.19.21.23. \| \| \| \| \| or or or or \| \| \| \| \| 4.12.6.10.14.16.18.20.22.24. |
| Attend opposite Outer Train-tackle | 19.3 or 20.4. |
| Stand by to hook Inner Train-tackle, } when the Outer tackle is a-block } | 17 or 18. |

3. "PIVOT TO RIGHT OR LEFT."

| | |
|-------------------------------|---|
| Haul on— | { 3.11.5. 9.13.15.17.19.21.*23. |
| Outer Train-tackle† | { or or or or 4.12.6.10.14.16.18.20.22.24. |

* Other numbers may be called to assist, if needed.

† The pivoting of so heavy a Gun is the most complicated of all the operations with it, and demands *special drill*. When done to windward, the hearty effort of the whole Gun's crew is required, particularly if there be much curve to the deck, and no deck circles; to leeward there is no difficulty, and the time at sea to pivot from side to side may vary from four to seven minutes. The advantage of the Pivot-boss will now appear, as it secures the coincidence of the hole

| | |
|---------------------------------------|-----------------------------|
| Ease away opposite Train-tackle | 19.3 or 20.4. |
| Hook to Slide, Inner Train-tackle and | |
| Haul Taut | .17. or 18. |
| Unhook Outer Train-tackles | .21.22.23.24. |
| In Fore Pivot-bolt | .8 or 4. |
| Shift Inner Train-tackles | { To rear of Slide . 19.20. |
| | { To Deck . 17.18. |
| Down Fore Slide-levers, unship | |
| them, and ship them on | .15.16. |
| Rear Slide Trucks* | |
| Hook Out-tackle block to Slide | .5.6. |

Take stations for next order—which, if the Gun is loaded, will be “Run Out;” if not loaded, will be “Sponge.”†

in Slide with that of the Socket, and permits the Bolt to be removed out or in easily. Hitherto the difficulty of doing so without a Boss has caused delay, and contributed more than anything else to the objections entertained against such heavy Ordnance, which has been in no-wise obviated by either the “Pivot Shifting Screws” of our own Navy, or the pivot Flap of the English Navy.

* Some difference of opinion may arise in regard to the shipping of these levers before the gun is Run Out, and they are required for pointing. To ship them now amounts to having them on the whole time—to which the only objection is, that if on, before wanted in pointing, they may be in the way of the men; and on the other hand, if not on, more attention may be demanded from 15, 16.

The question will not be material when the men are well drilled.

† The gun being now “pivoted to the Port,” the Breeching should be shackled, and the rear Pivot-bolt drawn, in regular order. But neither of these can be done without running out the gun a few feet. For in order to pivot with the greatest ease, the carriage had been previously run back on the Slide to the rear Hurter, so as to bring the

When the Gun is *Run Out*—

| | |
|--------------------------------|------------|
| Shackle Breeching* . . . | 3.13—4.14. |
| Draw the Rear Pivot-bolt . . . | 2. |

weight of the gun as near as possible to the Rear-pivot, the very best position being with the Trunnions of the Gun just forward of the Rear-pivot. The shackling of the Breeching and the removal of the Bolt are, therefore, deferred until the Gun has been run out in the subsequent proceedings.

The Breeching is always to be shackled to the Ship's Side—not to the *Slide*, which needlessly strains the pivoting, and also causes the shackle with its appliances to interfere with the working parts at the forward end of the Slide.

* It is generally expected that the Compressors are to supersede the necessity for a Breeching. But experience shows that in firing it is better to rely habitually on the Breeching, and use the Compressors to assist. Thus in firing to windward at Sea, the Compressors are *always* to be set, but only so hard as may be required to ease the shock on the Breeching. In firing to leeward, the Compressors are not wanted, except to secure the gun in its place when in. When the Ship is not steady, but rolling, the discretion is to be exercised.

The Preventor, or Inner-breeching, will be found indispensable to avoid accident when running out to leeward in a sea-way. For with a trained crew, and all precaution in handling the levers and In-tackles, there is a liability to the gun getting away, in which case it moves out with great violence, and may do serious damage. On one such occasion an XI-in. gun cracked the stout iron straps of the Compressors, and seemed but just prevented from freeing itself entirely and going overboard over the Port sill. Not being able to replace the Straps, the Compressors were useless till late in the cruise. Preventer Breechings were then fitted, and answered so well, that the practice was continued at sea as usual. They now form part of the equipment of all XI-in. guns, and should be just taut when the gun is out, and the Trucks of the Carriage *reach* but do *not ascend* the curve of the forward Hurter.

4. "SERVE VENT AND SPONGE."

208. No. 4 is to receive the moist sponge from No. 6, right hand over, left under, to send it home, and assisted by No. 8, to press it to the bottom of the Bore, then to turn it around two or three times in the direction that the worm may take,* withdraw it, strike the staff several smart taps under the muzzle, then return it to No. 6, who will receive it, and lay it down,† the Gun Captain stops the Vent,‡ and as soon as the Sponge has been withdrawn, serves the Vent with his priming wire and again stops it.

This being done—

* This is to detach from the bottom of the Chamber the fragments of burnt Flannel that are apt to adhere and solidify.

† This practice encumbers the deck, and interferes materially at times with the management of the gun. Trial was, therefore, made on board the Plymouth, where the gun was on a covered deck, of hooks attached to the beams above, near each piece, in which the Sponges and Rammers were placed after having been used. The only objection was, that too much time might be lost in so doing; but after continued trials this was found not to be the case when the men had been properly trained.

It is said that the idea originated in the British Gunnery Ship "Excellent."

‡ Stopping the vent is omitted by many practised Artillerists as unnecessary in extinguishing fragments of the Cartridges. But as so much importance has been and still is attached to its performance, and it costs so little trouble, it seems better to continue the practice, particularly when so many accidents occur from premature explosion, not only to untaught and careless people in saluting on holidays, but also on shipboard, where they ought not to happen.

No. 20 hands the Rammer to No. 4 as soon as the latter has been relieved of the Sponge by No. 6. Should 4 observe that the Gun Captain has neglected to serve the Vent, he is to call his attention to it.

No. 3 stands ready with the Powder which he has taken from No. 5, to whom it was passed by No. 25.

Nos. 7, 8, open the Shell-Box, disengage* the Shell, and place it in the Ladle, in readiness to pass to Nos. 3 and 5. (Special drill.)

5. "LOAD."

209. No. 3 places the charge in the muzzle, seam from the Vent,† small end in, and pushes it well in the Bore.

No. 4, who stands ready with the Rammer, enters it into the muzzle, and pushes the charge home steadily, until the mark on the Rammer handle shows the charge to be in place.‡ No 3 assists with one hand, and the charge is *on no account to be struck*.§

* Sometimes the box has been fitted too tightly to the Shell, or has contracted on it, and delay is caused in loading. This should be attended to in season.

† Otherwise the stout stuff and seams found necessary with heavy charges might resist the primer, and cause a failure to explode the powder.

‡ It was the habit at the Experimental Battery and in the "Plymouth," to mark the handle of the Rammer, so that there should be no doubt as to the charge being home. This is always useful, but particularly so in case of the gun bursting, as it makes sure of an important fact.

§ It is a common practice in loading, to expend much zeal in striking the cartridge one or two blows to insure its being home, which is

Whilst No. 4 withdraws the Rammer, Nos. 7, 8 each take a handle of the Ladle, lift up the Shell,* and, assisted by No. 5, pass it on to Nos. 3 and 4, who enter the shell into the muzzle Sabot first and Fuze out, as soon as the Rammer is clear of the muzzle.

As the Shell lies just fair with the muzzle, No. 3 removes the cap from Fuze,† which is passed along to the Gun Captain, and pushes the Shell into the Bore.

quite unnecessary when the mark on the handle affords so much better evidence thereof.

* The XI-in. Shell weighs, when loaded, 135 lbs., the lifting and entering it into the muzzle was one of the bug-a-boos that long afflicted those who were opposed to the use of heavy calibres. There was not one of the crew of the "Plymouth's" XI-in. gun that was not found able, on trial, to take up the Shell and unassisted to put it in the Bore when the ship was still. At sea a very simple instrument was used, (an iron segment with a bent handle on opposite sides). The Shell men 7, 8, turned the shell out of the box into this ladle placed on the deck near No. 8, (the Loader,) who, when ready, took the left handle, and No. 5 (the 2d Loader) the right. These two lifted the Shell towards the muzzle, and No. 4, (Sponger,) standing on the Slide, received the right hand from No. 5 as soon as within reach. No. 8 (stepping on the Slide) and No. 4 continued to raise the *Shell to the muzzle* which was not difficult because of the Bore being conveniently high above the Slide on which they were standing; the Sabot projecting beyond the Ladle was entered into the muzzle, and the Shell pushed in, No. 5 taking the Ladle back and laying it on the deck.

† As this is very firmly fixed in the recess of the metal stock, it is to be removed by pulling *directly* on the tail, which, if twisted, will be likely to break, and thus cause a loss of time. The patch is passed to the Gun Captain, who puts it in his belt-box, and is afterward handed to the quarter deck by the Lieut. of Division, in order to verify the number of shells fired. When the Fuze has been uncovered, care

No. 4 enters the Rammer, and, assisted by No. 3, pushes in the shell until the mark on the handle shows it to be in place. It is most strictly forbidden to strike the shell with the Rammer.*

No. 6 takes the Rammer from No. 4 and lays it down, or lodges it overhead on the hooks. Whilst this has been doing, the preparation for the next order is to go on.† Nos. 13, 14 ease Compressors, if no motion. If there is, they stand ready to ease at next order. The Out-tackles are manned by Nos. 19, 21, 23, 17, 15, 11, 13, and 20, 22, 24, 18, 16, 12, 14. The Inner-tackles tended by No. 2 and Qr. Gunner. The Fore Carriage Levers grasped by 3, 8, and 4, 9. The Rear by 11, 12.

6. "RUN OUT."

210. The mode of executing this order will vary with circumstances—by the gun being to windward or to leeward, and by the nature of the rolling motion.

must be taken not to let it be touched by the moisture of the hand, or by the sea water.

* As the blow might dislodge the priming of the Fuze and prevent, its ignition. It is well to dispense with any wad, even a gromet, if possible.

† A good exemplification of the principle assumed for this exercise, that when any one of the men has executed an order he shall not remain in position until the order is given which requires him elsewhere; for he may not have any part in the next order, or even in that second next, as occurs after pivoting, when only a few numbers participate in the following orders: Sponge—Load, the remainder only doing so at the third following, viz.; Run Out.

To leeward, and with much motion, the tendency is to go out with dangerous violence.*

Therefore, Nos. 5, 19, 21, 23, 17, 15, 13, and 6, 20, 22, 24, 18, 16, 14, haul cautiously on the Out-tackles, the Qr. Gunner and No. 2, assisted by 15, 16, holding well back on the In-tackles with a turn caught; 13, 14 ease the Compressors; Nos. 3, 9, and 4, 10 heave up the Fore Carriage Levers; Nos. 11, 12 keep down the Rear Carriage Levers, unless it is seen that they are necessary:

In running out *to windward*† the compressors may be eased at once, the In-tackles slacked, the Carriage hove up on its trucks, and the gun run out by the Out-Tacklemen, assisted by any other of the Nos. not employed in other duties. When out, the Carriage-levers are let

* No operation with this gun requires more care. There is a weight of 20,000 lbs. moving on Friction Rollers along a metal plate, down an inclined plane—if once permitted to get loose and to be propelled by the motion of the ship, the momentum is immense, and must disable some of the apparatus, perhaps the Gun-carriage itself. On such an occasion the preventer breeching is invaluable, and will be the best safeguard, if fitted so that when well stretched it will not permit the Fore-trucks to ascend on the curve of the Fore-hurter, for it is this which strains the strap of the Compressor.

Suffering the gun to go out with much orce also displaces the shell whether a gromet wad be used or not.

† To windward with a steady inclination the precautions used to leeward are unnecessary. On the contrary, the difficulty is to move so great a weight up the inclined plane. Therefore, the carriage is released from all restraint, and all the available force put at the Out-tackles, taking advantage also of whatever roll there may be to windward.

down promptly and unshipped. The Compressors are set* and Rear Slide-lever shipped.

7. "PRIME."

211. The Gun Captain again makes sure that the Vent is clear,† and in so doing lets his wire down quickly into the charge.‡ If all is right, he inserts a primer.

If the Slide levers have not been shipped, or have been unshipped, they must now be put on the axles of the Rear Slide Trucks—15, 16.

The Rear Train-tackles will be manned by

| | |
|------|------------------------|
| Nos. | { 18.15.17.19.21.23.5. |
| | { 14.16.18.20.22.24.6. |

* This must, of course, be regulated by circumstances, as already mentioned in Note 10; to windward set the compressors moderately; to leeward, not at all; off the wind, according to the roll. Let the compression be so adjusted as to allow the muzzle just to come in.

† It is an old custom for the Gun Captain to keep the Priming-wire in the vent while the loading is going on, feeling from time to time if the charge is home. It is a bad practice, because there is a liability of being caught by the charge as it comes along the Bore and having the wire bent, thus spiking the vent for a while at least. The mark on the Rammer handle is the best evidence that the charge is in place. The object now is only to clear the vent of pieces of cartridge stuff, which not unfrequently get into the vent, and choke it so as to prevent the primer from exploding the powder.

‡ Though the primers seldom fail to penetrate the flannel stuff of the cartridge, it is well to pierce the latter with the wire, so as not to omit any means that may insure the instant discharge of the gun.

8. "AIM."

212. The Gun Captain adjusts or verifies the sliding Bar of the Rear-sight to the desired range,* and steps off the slide directly to the rear, lock-laniard in hand. The 2d Captain takes hold of the elevating screw,† 15, 16 heave up the levers of Rear slide trucks, and the training tackles are manned by

Nos. { 13.15.17.19.21.23.5.
 { 14.16.18.20.22.24.6.

(Muzzle to the right or left.)

9. "READY—FIRE."

213. The Gun Captain, with lock-laniard just taut and eye ranging over the sights, but kept well down to the bottom of the notch in head of sliding bar, and over the point of middle sight, awaits these being brought into coincidence by the roll with the object, which is always the WATER LINE—the Slide being trained constantly as desired by voice or sign.‡

* The Sight Bar of the XI-in. Gun is graduated to its own charge only; if reduced charges are ever used, it will only be at short distances when the gun needs no elevation. The Bar will then be down entirely, its head resting on the Box.

† One turn of which is equal to one degree of the quadrant, and may be of service when the Sight Bars are not.

The carriages of Gun Sloops and other vessels carrying XI-in. guns allow of an elevation of 20°.

‡ When the vessels are moving, it is best to train the gun a little ahead, watching when the object draws in line; then, as the roll brings the piece right in elevation, it is fired.

When sure of his aim the Gun Captain draws the lock-laniard promptly and firmly.

If the primer miss, the 2d Captain removes it, clears the vent, and puts in a fresh primer.

If the gun, when fired, does not come into its place for loading, ship Carriage-levers, heave up, and run in by the In-tackles to a taut breeching.

Down all levers and set Compressors.

If the firing or exercise is to continue, the next order is "*Sponge.*"

If not, unshackle the breeching, then—*Run in*, back to rear hurter for pivoting—"Stand by to Pivot"—"Pivot to right or left;" when amidships—*In Pivot-bolt*—"Run out," and secure for sea.

10. "SHIFT TO HOUSING-PIVOT, AND SECURE!"

214. The gun is brought into the housing position amidships and pivoted to the socket farthest from the extremity of the vessel, and run out.

No. 1 puts in the vent-plug, wipes and lays the hammer in place and the lock-string around it, and puts on the lock-cover; sees his gun properly secured, and the implements and spare articles returned to their places.

No. 2 levels the gun and wipes off and relackers rear pivot-bolt and elevating screw; puts on sight aprons; puts in rail-chocks and assists in securing lashings and breeching.

Loaders put in the tompion and on muzzle-bag, and wipe off and relacker the front pivot-bolt.

Spongers return rammer and sponge to place, and assist in securing lashings and breeching.

Levermen wipe off and relacker their respective levers and eccentrics, and secure levers in place and assist in securing the gun.

Compressor men wipe off, relacker, and tighten the compressors, and assist Carpenter in replacing and securing bulwarks.

Shellmen return shells, empty boxes, and shell-bearer to their places, and assist in securing bulwarks.

Powderman returns spare powder and passing-box to the magazine.

Tacklemen tighten and secure "in" and "out-tackles," and make up and stow "shifting" and "training-tackles" on the slide; ship the clevis-bolts, and pass and tighten the gun-lashings; and, if required, assist in replacing bulwarks.

The several persons who provide implements and spare articles return them to their places.

Transporting Pivot Guns from one End of a Vessel to the other.

215. The gun is to be pivoted and trained so as to bring its muzzle towards the direction in which it is to be transported, the transporting trucks are to be shipped and secured to their axles, the chocking quoins placed, the training trucks thrown out of action, the compressors brought to bear to confine the gun near the middle of the slide, some of the tackles hooked for dragging, and

others, with capstan bars, for guiding and steadying it. The pivot-bolts are to be removed, and the gun's crew, aided by others if required, are then to transport it to the desired position at the other end of the vessel. The slide is then brought over and pivoted upon a fighting or outer centre, the transporting trucks removed, and the training trucks brought into action. The implements for working and loading the gun are to be brought to it, and it will then be ready for action.

When the forward and after slides are of different lengths, and the traversing circles of different diameters, the longest slide will be fitted with an additional rear pivot-hole and plate, to correspond with the smaller circle, that the gun may be worked from the midship pivot-bolt and shifted to the different fighting centres or pivot-bolts of the smaller circle.

Thus, when only one pivot gun is mounted forward and one aft, when they can both be brought to bear from only one end of the vessel, the force may be doubled at that extremity, by pivoting one gun on each bow or quarter, as the case may be.

For heavy guns this is practicable in smooth water only !

Arrangements are made for shifting the broadside guns both to the bow and stern, in aid of the pivot guns, when the distance of the enemy is not too great. When the stern gun is pivoted over the rudder, one of the broadside guns may be worked on each side of it, in firing right aft. Guns mounted on pivot carriages may be

fought upon the rear pivot, on the common or shifting centre, and fired from any point of the traversing or shifting circle, if the elevation be such as will not endanger the decks. In this case the training must be done with the gun run in over the rear pivot, as after it is run out the training will be difficult, and the helm must be relied on to bring the gun on with the object.

BOARDERS.

216. It is not supposed that any directions can be framed in such a way as entirely to provide for all the various circumstances which may require attention when about to board an enemy, or to repel a similar assault made by an enemy upon our vessels.

The following general suggestions are, however, presented for the consideration of Captains, in order that some degree of uniformity may be preserved when other more important considerations do not prevent it.

217. Upon the call for "Boarders," the divisions which may be called should form on the gangway of the side which is not engaged, properly armed, and remain there till ordered elsewhere, provided there be time to make this disposition of them. In all movements from one part of the ship to another cutlasses should be sheathed and pistols in the frogs. The men of each division should be united as much as possible under their own officer. Bayonets not fixed until ordered.

"Prepare to Board!"

(FROM ANY SPECIFIED PART OF THE SHIP.)

218. The Boarders should repair to the place directed, taking care to keep themselves down so as not to be seen by the enemy, and form close to the bulwarks until the order is given to—

"Board the Enemy!"

219. The Boarders should then gain the enemy's deck as quickly as possible, keeping near enough to each other for mutual support, and to act in concert against the opposing force, using every possible exertion to clear the enemy's decks, by disabling or driving the men below.

In case the intention of boarding should be discovered by the enemy, and he should collect his men to repel the attack, the marines and small-arm men should take positions where they can best fire upon the men thus collected, and, if possible, the spar-deck guns loaded with grape, and howitzers loaded with canister, should be used for the same purpose, before the Boarders are ordered to make the attack.

So long as the contest is continued after boarding, the fire should be kept up against the enemy from all the guns with as much vigor as the number of men remaining at the guns will allow.

The guns should be much depressed at such time, that there may be little or no danger to our own men. Much

positive injury may be inflicted on the enemy in this way, besides the advantage of dividing his attention at such an important moment.

If it should be necessary to repel Boarders from the enemy, the Boarders and Pikemen should be called, and at the order—

"Prepare to Repel Boarders!"

(AT ANY SPECIFIED PART OF THE SHIP.)

220. The Pikemen should arrange themselves in rear of those armed with swords, and in situations which will allow them to rest the points of their pikes on the hammocks or rail, and cover that part of the ship, and the parts where the assault is expected. The Marines, with their muskets loaded and bayonets fixed, may be formed behind the Pikemen, or at any other place from which their fire on an assailing enemy may be most effective, and least dangerous to our own men.

221. The moment an enemy commences his assault, the order—

"Repel Boarders!"

should be given, and every effort made to prevent his gaining or retaining any foothold in the ship.

It will, of course, be important to bring grape and musketry to bear at once upon the enemy's men when they are assembled for boarding, if they should be discovered in time.

The men left at the guns should be watchful that the enemy does not gain an entrance through ports or quarter-galleries.

In case the enemy should effect a landing on the decks, the pikes may, from their length and the press of the contending parties, become less efficient than the swords. Whenever this occurs the sword should be brought into full use as the most efficient weapon for attack or defence at such close quarters.

222. The howitzers, mounted on the field-carriage and charged with canister, should be ready for use in case of the emergency of the enemy's getting a footing on the spar-deck.

223. Unless induced by circumstances to attempt to board the enemy first, the most favorable opportunity for attack will present itself when his men have been driven back; and to guard against the contingency of being repulsed, in all cases where the Boarders are called to attack the enemy, they are to be covered by the Marines and all the available Small-arm men on deck.

224. The men, and especially the Boarders and Pike-men, should be exercised and encouraged to practice with the single stick and sword as far as circumstances will allow.

NOTES UPON THE MANUAL EXERCISE.

FOURTH COMMAND.

"Serve the Vent and Sponge."

"The Gun Captain stops the Vent."

225. A difference of opinion being entertained among artillerists with regard to the utility of stopping the vent, the continuance of the practice, as directed in the text, is recommended.

226. It has been the uniform practice at the Experimental Battery at the navy yard, Washington, and also on board the gunnery ship Plymouth, in 1857-'58, to use a moist sponge; and as no accident from premature explosion has taken place in either case, the inference is that the method is a safe one, and might obviate other precautions, especially where reloading is necessary, as in firing salutes, and there being no shot over the cartridge, it is imperfectly consumed.

227. "*Strikes the staff several smart taps under the muzzle,*" to shake off any adhering fragments of the cartridge. Should any burning fragments be drawn out, the Loader extinguishes them with the wet swab; the Gun Captain again commands "sponge."

228. Gun Captain "*serves the vent with his priming-wire.*" If at any time he should find the vent obstructed, and be unable to clear it with the priming-wire or bor-

ing-bit, he will at once report to the officer of division who will order the vent-punch used; or if this should fail, have recourse to the vent-drill and brace in charge of the Quarter Gunner. The boring-bit, vent-punch, and drills should be used with caution, as, being steel, they are liable to be broken off in the vent, and thus effectually spike the gun. After clearing the vent, the bore should be sponged.

229. Spongers and Loaders are to be careful to keep their bodies as much within the port as practicable, otherwise at close quarters they will be picked off by musketry.

FIFTH COMMAND.

"Load."

"No. 3 removes cap from fuze."

230. The cap is never to be removed until the shell has been entered in the gun. With high elevations, or when rolling, care should be taken that the shell does not slip down the bore before this is done.

The cap or patch is removed by taking hold of the *lug* with the fore finger and thumb, first raising it a little, and without twisting; a pull readily removes it. The patch is passed to the Gun Captain as an evidence that the priming has been exposed; the patches to be preserved and accounted for at the end of the firing.

231. The Loader is to be careful not to touch the fuze composition with his fingers, for fear of injuring it

by moisture. Where the firing is not hurried, it is advisable to raise the priming of the fuze to insure its ignition. All of these details should be carefully explained.

No wad is required over a shell, but a selvagee wad may be used in heavy rolling.

232. When loading with shot, a selvagee wad is placed over it. A part (half or a third) of a selvagee wad is equally efficient in holding the shot in place.

233. If in loading, a shot or shell should stick in the bore, no attempt should be made to force it down, but it should be withdrawn. This may be done with the ladle, by depressing and striking the muzzle hard against the lower sill of the port, or by running the gun out hard against the side at extreme depression.

234. The sabots of shells are sometimes carelessly made so large that if swollen by wet, they will not enter the gun; also by the accumulation of paint and thickness of straps. If the impediment is caused by a shot, it should be thrown overboard at once.

235. No gun is to be loaded with more than a single shot at once, without the express sanction of the Captain, and *never* with more than a single shell. Solid shot are not to be fired from shell guns without a direct order from the Captain.

236. Although double shotting may be attended with advantages when in very close action, it should not be permitted with guns which have been weakened by any extraordinary service, nor in others without due consideration of the extra strain upon the guns and their

equipments, and a comparison of its probable advantages over rapid firing with single shot by simultaneous loading.

Double shot should only be used against an enemy directly abeam.

Experiments have shown that two solid shots, when fired from 32-pounder shot guns of 46 cwt. and upwards, will generally range sufficiently near together, and have sufficient penetrating power to produce destructive effect upon the broadside of a ship when not more than 300 yards distant. Beyond that distance, the divergence of shot is so great, that even when they retain sufficient penetrating power, their use becomes improper. From 82-pounder guns of less than 46 cwt. the use of two shot against ships should be limited to a distance not exceeding 200 yards.

Whenever the firing is oblique to the surface of the object, double shotting should not be used beyond half these distances.*

237. Experiments show that firing two *loaded* shells together should never be practised. With quite reduced charges, [of from one-eighth to one-twelfth the weight of the *single shell*,] of 88 loaded shells thus fired 25 were broken, and 43 did not explode, and some of the remainder were exploded too soon by the shock of discharge.

* In the action between the Chesapeake and Shannon, at not over 200 yards distance, the gun-deck batteries of both vessels were double shotted, and not one-half the shot which hit went through the sides of either of the opponent's ships.

Of 50 *unloaded* 8-inch shells, fired two at the same time, with 6 pounds of powder, only one was broken by the shock of the discharge. This difference between loaded and empty shells is accounted for by the fact that a small hole is generally broken into the outer shell, through which its charge is ignited. (*See p. 13, Report of Admiral Farragut, dated August 31, 1853, on experiments made at Old Point Comfort.*)

238. In loading with a shell, the most exact attention is required to all the precautions relating to the position of the fuze and the mode of setting home the shell. The Loader is to be specially instructed that unless the leaden patch is stripped off to expose the priming, the fuze will not ignite, and consequently the shell cannot explode.

239. *Grape shot* have not sufficient penetration to be used with effect, generally, against ships-of-war beyond 150 yards. When the men on the spar decks of the enemy are exposed by the heeling of the ship, grape or canister may be used against them at distances varying from 200 to 300 yards. Against light vessels, boats, or masses of men, a single stand of grape from heavy guns may be used at about 400, and a double stand at about 300 yards. The dispersion of the balls is about one-tenth the distance.

240. The use of a solid shot and a stand of grape together is not to be encouraged.

The elevation of the gun necessary to render one effective makes the other comparatively useless. And for

the same reason, grape and canister cannot be fired together with any certainty of effect; but a wad behind either grape or canister adds very much to the effect.

241. *Canister or case shot*, prepared for immediate use, are supplied for the boat, and field howitzers, and are effective at short distances against boats or exposed bodies of men; they may be used also, under favorable circumstances, against the tops of an enemy.

SEVENTH COMMAND.

"Prime."

"He inserts a primer, and turns the hammer down upon it."

242. To prevent the primer from being blown out of the vent by the blast of the next gun, as occasionally happens on light-covered decks.

With guns of the old pattern this cannot be done, because, if turned down, it would interfere with the aim.

243. It is essential that the head of the primer shall be placed flat and pressed close upon the vent, that the hammer may strike it fairly. The tip of shellac, by which the lower end of the tube is sealed, occasionally obstructs the jet of flame so as to split the tube. In this case the flame is dispersed laterally, and fails to ignite the charge; it is therefore a good precaution to pinch the end of the tube before putting it into the vent.*

* "In 10,000 fires, when testing guns of different calibres, with the regulation locks, less than fifty primers failed from all causes."

244. The tubes of all the primers are carefully gauged before issuing them for service, but such as, from any cause, become so much enlarged as not to go easily into the vent, should be rejected without attempting to force them down.

It will occasionally happen, either from carelessness or inattention to the instructions given for the proper manner of pulling the lock-string, that the head of the primer will be crushed without exploding it. Frequently a second and stronger pull will have the desired effect, if the fulminate has not been dispersed: in case, however, this attempt should prove unsuccessful, the tube of the primer should be drawn out, if possible, before using the priming-wire to clear the vent.

245. In case either lock or primer should entirely fail, recourse will be had to the *friction-primers* or to the "*spur-tubes*." In using the first, the Captain of the gun, after taking the primer from the box, will raise up the twisted wire-loop until it is on a line with the spur; place the tube in the vent with the spur towards the muzzle of the gun, and so that this spur will rest on the lock-piece; then hook the laniard, fitted for the purpose, into the raised loop, and pull it, when otherwise ready to fire the gun, as though it were a lock-string, using, however, a less degree of force. The laniard may be hooked to the loop before the tube is put into the vent. When the "*spur-tubes*" are used, the 1st Captain exposes the priming, and the 2d Captain uses the match.

246. The men should be practiced at unloaded guns,

in placing the primers, both percussion and friction, properly, and in pulling the lock-string so as to insure their explosion, until this very essential knowledge and skill have been perfectly attained.

EIGHTH COMMAND.

"Aim!"

"His eye ranging over the sights!"

247. The Gun Captain gives the necessary order "Muzzle to right," or "Left," "Elevate," or "Depress," by voice or sign. He alone should speak, giving his orders in a sharp, clear tone, but not louder than necessary for his own crew to hear him.

248. He should make use of the following signs, to assist in making himself understood, which, when the crew becomes well drilled, are sufficient without the orders.

In pointing.—He should move the left hand, held vertically, to the right or left, according as he wishes the right or left tackle hauled upon.

In elevating.—He should move the hand, held horizontally, up or down, according as he wishes the breech raised or lowered.

249. Officers of divisions, while instructing the men in aiming, should be particular in impressing upon their minds the necessity of bringing the eye to an exact level with the *bottom* of the sight-notch, as otherwise they will fire too high.

250. In lateral training, when the direction of the gun is frequently changed by the "coming up" or "falling off" of the ship, or when the position of the object to be fired at is rapidly changing by passing in opposite directions, or from other causes, it is better to train a little beyond, and then watch the proper moment for firing, instead of endeavoring to train it at once directly on the object.

251. The lateral training, or pointing, when considerable, should always precede the elevation.

252. "*If roller-handspike is not used in training, &c.*" A great difference of opinion exists on this point. The use of the roller-handspike somewhat facilitates *extreme train*, but the gun cannot be fired until it is unshipped, which alters the elevation and consumes time. It is perhaps preferable to use one handspike under the bracket, manned by two men, and the other to "lift and screw the gun," manned by one man, under the transom.

253. "*Elevate or depress as directed!*" If the carriage is fitted with a quoin, handspikemen, standing between the handspikes and the side of the ship, place their handspikes on the steps of the carriage and raise the breech. As soon as the quoin is free, the 2d Captain takes hold of it with both hands, and withdraws the quoin to the full extent; handspikemen "raise" or "lower" the gun slowly and steadily. When the proper elevation is given, the Gun Captain gives the word "*Well!*" and the 2d Captain forces the quoin tight un-

der the breech, giving the word "*Down!*" as soon as he perceives the quoin supports the gun.

254. To facilitate the operation of pointing guns according to the distance of the object aimed at, sights are prepared and fitted to each gun; as breast-sweeps should also be for all truck-carriages of heavy guns.

The ordinary sights which are now fitted consist of two pieces of bronze gun metal, one of which, called the "*reinforce sight*," is a fixed *point*, firmly secured to the sight-mass, upon the upper surface of the gun, between the trunnions.

255. The other, or "*breech sight*," is a bar or stem, with a "head," in the top of which is a "sight-notch." This bar or stem is made to slide in a vertical plane, in the "*sight-box*" fixed to the breech sight-mass, and is held at the various elevations for which it is graduated by means of a thumbscrew.

The bar or stem of the sight has lines across its faces denoting for all the old guns degrees of elevation, each of which is marked with the number of yards at which a shot or shell will strike the point aimed at, when that line is brought to a level with the top of the sight-box, and the gun is loaded with a specified charge of powder; for the guns of the new system, the ranges in even hundreds of yards.

The uppermost line on the stem marked "*level*" is the zero of the other graduations, and when adjusted to the level of the top of the sight-box, the bottom of the notch in the head of the breech-sight and the apex of the re-

inforce-sight show the "dispart" of the gun. When the line of sight coincides with these points, it is parallel to the bore, and when continued to a distant horizon, the gun is laid "level" or horizontal.

Sights should invariably be made so that the "level" line on the stem will correspond with the bottom of the head where it rests on the "sight-box," and thus secure a dispart-sight in case of accident to the screw in the sight-box.

256. For shot guns the ranges in yards for one shot with the "*distant firing*" charge of powder, are marked for each degree of elevation on the *inboard* face of the sight-bar.

257. The gun being raised a certain height above the water, depending on the class of vessel and the deck on which it is mounted, it is evident that, with the sight at "*level*," the shot will have a range proportionate to this height. This range or distance is commonly called "*point-blank*," or "*point-blank range*," and is the number noted in the column marked "P. B.," or "0°," or "*level*" in range tables.

This "point blank," therefore, depends on the class of gun, the charge, and the height above the water.

258. A preferable definition of this distance is "*range at level*."

259. As the aim is always supposed to be directed at the water line, if it were thus taken with the sight at "*level*" at an object at point-blank range, the shot would strike short of the point aimed at by about one quarter

of the distance ; or, if aimed at the upper part of the hull; a distance below the point aimed at equal to the height of the gun.

260. In firing at small objects, particularly boats, within point-blank, it is therefore important to attend to this source of error. It is desirable that all sights should be marked from 100 yards to the greatest range, and therefore avoid all consideration of point-blank.

For shell guns the ranges are marked for shells on the sight-bars in the same manner as those for the shot of shot guns.

261. These sights being each adjusted to a particular gun, and marked with its class and number, do not, in strictness, admit of being transferred to other guns, even of the same class.

262. When used, the stem of the breech sight must be raised or lowered to correspond with the ascertained or estimated distance, in yards, of the object aimed at, and firmly secured there by the thumbscrew. Then, if the ship be steady, elevate or depress the gun until the line of sight from the bottom of the notch of the breech sight, the top of the reinforce sight, and the point to be struck, will coincide ; but, if the ship have a rolling motion, the gun must be so laid, after the sight is set for the distance, that this coincidence may be obtained, if possible, at the most favorable part of every roll which the ship makes.

263. The inclination of the line of metal to the axis of the bore varies in guns of the same class, as well as in

those of different classes. Aiming, therefore, by the line of metal cannot be relied on for definite ranges; besides that, within those ranges, it is apt to mislead by giving too much elevation to the piece. Therefore, when the established sights are not furnished, or have become unserviceable, *wooden* dispart-sights lashed on the reinforce should be immediately substituted. A narrow groove in the upper surface of the wooden sight, made to coincide with the plane of the line of sight marked on the gun, will assist the Gun Captain in getting the true direction quickly.

Half the difference between the diameters of the gun at the base-ring and swell of the muzzle, or at any intermediate point on the line of metal, will give the proper height of the dispart-sight at the point where the least diameter was taken, to which must be added the height of the lock-piece above the base ring, in order to get a line of sight over it, parallel to the axis of the bore.

264. All the new guns are marked on the top of the lock-piece, or over the vent, the reinforce sight-mass, and the swell of the muzzle, by notches which indicate a vertical plane passing through the axis of the bore, at right angles to the axis of the trunnions.

265. Pivot guns have been supplied with trunnion sights, which were designed to be used *only* when the ordinary sights will not give the required elevation, as this instrument gives but a rude approximation in either elevation or direction.

266. The rifled cannon in service have the breech

sight on the side of the breech, and the front sight on the trunnion, which permits the gun to be accurately aimed at all elevations. It is intended in future to apply this arrangement to all cannon mounted on pivot carriages.

267. Various modes have been practiced to ascertain the *distance* from the object aimed at, when at sea, by which to regulate the elevation of guns, but none can be depended upon for giving it with minute accuracy, and when obtained it is continually varying; therefore, when the projectile fired is seen to exceed or fall short of the object considerably, the sight-bar must be readjusted accordingly. It thus becomes, under ordinary circumstances, the best instrument for approximating distances. In correcting the elevation, however, the variation of range to the first graze, attributable to eccentricity, differences of windage, and other causes, must be taken into consideration, as, under the most favorable circumstances, at the Experimental Battery, this variation is found to equal fifty yards, more or less.

268. In case the ordinary sights should be lost or rendered useless, *tangent firing* may be resorted to against ships, by pointing with the wooden dispart-sight at such part of the ship as the tables indicate for the distance, and according to the class of gun in use at the time.

A table of this kind is appended, which has been calculated for the 8-inch and some of the heavier of the 32-pounder guns, when loaded with single shot and distant-firing charges.

The different classes of sailing ships-of-war, whether of the same or of different nations, are not of the same length, nor are their masts of the same height from the deck, or from the water. They, however, correspond so nearly, for the same class of ships of the same nation, that calculations made from the angles subtended by the average height of their masts, will generally give their distance with sufficient accuracy for general firing.

Tables are inserted at the end of the book, in which the distances corresponding to different angles made by the masts of English and French ships-of-war are shown—from which the intermediate distances due to other angles may be estimated, and the sights regulated accordingly, if circumstances should render it desirable. Also an abridged table in which the height of our own mast is used as the base.

269. Officers of divisions and Captains of guns should be occasionally practiced in measuring the distances of objects by the eye, at times when opportunities offer of verifying the accuracy of their estimate by comparing it with the distance obtained by the foregoing methods, or any other which will afford the best means of comparison.

270. Within point-blank range, if from any cause the *hull* of an enemy's vessel at such times cannot be seen, but only its *direction* be known, advantage may be taken of the flashes of the enemy's guns to determine, approximately, when the guns are level, in case the ship has a heel or a rolling motion.

271. Most naval guns are now fitted with elevating screws, passing through a hole in the cascabel of the Dahlgren system, and for those of the old system attached to the carriage: but the ordinary beds and quoins are also still in use; they are arranged to allow the extreme elevation and depression of the guns which the ports will admit with safety. When the inner or thick end of the quoin is fair with the end of the bed in place, the gun is level in the carriage; or horizontal, when the ship is upright. The degrees of elevation above this level, which may be given to the gun by drawing out the quoin when laid on its base, are marked on the side or edge, and those of depression on the flat part of the quoin, so that when the quoin is turned on its side for depressing, the marks may be seen. The *level* mark on the quoin is to correspond with the end of the bed. When the quoin is entirely removed, and the breech of the gun rests on the bed, the gun has its greatest safe elevation; and when the quoin is pushed home on its side, the gun has the greatest safe depression that the port will admit.

Care must be taken that the stop on the quoin is always properly lodged, to prevent the quoin from flying out or changing its position, and that the bed is secured to the bed-bolt.

Porter's bed and quoin has been adopted for all carriages requiring them.

When the *elevating screw* is used, a quoin should be at hand to place under the breech of the gun, when at ex-

• treme elevation, to relieve the screw from the shock of the discharge, and prevent a change of the elevation, as well as to take the place of the screw, if it should be disabled. When the fire is continuous at the same distance, the lever of the elevating screw should be secured by a laniard, to prevent the screw from turning and altering the elevation.

272. If a greater elevation for broadside guns should be desired for any special purpose, it may be obtained by placing inclined planes behind the rear trucks for them to recoil over, and produce a corresponding depression of the muzzle of the gun as it comes within the port. But it will be observed that beyond the elevation which the ports will admit of, the sights can no longer be taken by the tangent or any other top sight, as the upper sill of the port interferes. The gun must therefore be laid by the quoin and pendulum.

Additional depression may also be obtained by placing inclined planes for the front trucks to recoil upon, or by raising the breech by means of a wooden toggle placed vertically under it. One end of a tripping line is fastened to the middle of the toggle, and the other to the breeching bolt in the side of the ship; by this arrangement the toggle is tripped from its place at the commencement of the recoil, and the muzzle is raised so as to clear the port sill by the preponderance of the breech.

NINTH COMMAND.

"Ready—Fire!"

"Waits patiently for the coincidence of the sights upon the object."

273. The exact moment for firing, at sea, necessarily varies with circumstances; but when these are favorable the following general principles should govern:

274. When the ship is steady, the gun should be fired when the line of sight is brought upon the object; but when the ship has much rolling motion, the moment for firing should be chosen a little before, so that the shot will probably leave the gun when the roll brings the line of sight upon the object aimed at.

When practicable, and too much time will not be lost, it will be best to fire when the vessel is on the top of a wave, and just begins to roll towards the object. If the loss of time should be found objectionable, the gun may be fired at any other instant, when properly pointed, giving a preference, however, to the moment when rolling *towards* rather than when rolling *from* the object, and making due allowance for the probable change of elevation by the roll of the ship, before the shot leaves the gun.

275. If, from *any cause*, the firing should be delayed after the gun has been pointed, it should be carefully pointed again before the order to fire is given.

276. The great object is to fire *low enough* to strike

the hull, if the shot preserve the *intended* direction, and as a general rule, to strike it near the *water-line*.

277. To avoid loss of shot from lateral deviations, it is recommended to direct all the guns to be pointed to strike somewhere between the fore and mizzen masts of an enemy; when quite near, the guns of the forward divisions should be pointed in preference to that part of the hull about the foremast, and one or two of the after guns at the rudder, if it should be fairly exposed.

Remarks on the Different Kinds of Firing.

278. *Firing at will.*—By this is meant firing the guns independently of each other, each Captain of a gun seizing the most favorable opportunity. This firing should always be used in action (unless ordered to the contrary) whenever the object is visible, the smoke from one gun not greatly impeding the firing of another.

279. *Firing in succession.*—By this is meant firing one gun after another in regular order, commencing from the foremost or after gun, according as the wind is blowing from *ast* or *forward*. This firing may be used with advantage in the commencement of an action, or whenever a *continuous steady fire* is desired, as the smoke from one gun will not impede the firing of the next.

280. *Quick firing.*—By this is meant rapid firing at will, the tangent sight not being raised. This firing should be used when close alongside an enemy, as then but little pointing would be required.

281. When the guns are laid for the projectile to strike the object aimed at without grazing between the gun and the object, the firing is said to be *direct*. This mode of firing is to be preferred when the object fired at is so near that the chances of hitting it are very great, and also when the intervening surface between the gun and object is so rough or irregular that a projectile striking it would have its velocity much diminished or destroyed, and its direction injuriously affected.

Direct firing requires a good knowledge of distance, and precision both of elevation and lateral direction, in order to strike an object which is comparatively a point.

282. When the guns are so laid that the projectile makes one or more grazes between the gun and the object, and continues its flight, the firing is denominated *ricochet*.

Ricochet firing, upon a smooth surface within certain distances, has some important advantages over direct firing. When the guns have very little or no elevation, and are near the water, as they are in a ship's battery, the projectile strikes the water at a very small angle; its flight is very little retarded by the graze, and it rises but little above the surface in its course.

Ricochet firing at low elevations requires only correct lateral direction, since the projectile would rarely pass over, and would probably strike a vessel if within its effective range, whether the actual distance had been correctly ascertained or not.

The deviation of projectiles is, however, generally in-

creased by ricochet, and in proportion to the roughness of the surface of the water. Even a slight ripple will make a perceptible difference not only in direction, but in range and penetration, and the height to which the projectile will rise in its bounds.

Although these facts demand attention, yet when the estimated distance does not require an elevation of more than three degrees, projectiles from guns pointed rather too low for direct firing will probably ricochet and strike the object with effect, even when the water is considerably rough.

When the water is not smooth, the most favorable circumstances for ricochet firing are when the flight of the shot is with the roll of the sea, and the sea is long and regular.

Ricochet will be effective against small objects up to 2,000 yards, but should not commence before 600 yards; at less distance it is preferable to fire direct. Ricochet is of no value from rifled guns firing elongated projectiles, as they lose all certainty of direction on the rebound.

Upon *smooth* water, a shot fired horizontally from the 32-pounder of 33 cwt., with four and a half pounds of powder, ricocheted and rolled about 3,000 yards; the greatest range obtained from an elevation of five degrees, with the same gun and charge, was less than 1,800 yards. (See *Dahlgren's Report on 32-pounder of 33 cwt.*, p. 90.)

Shot rarely ricochet at all with elevations above 5°, and the bounds are always higher, with equal charges

from the same gun, as the elevation of the gun is increased.

283. *Concentration of fire* may be desirable under certain circumstances; and arrangements have been sometimes made to secure it by the simultaneous discharge of a number of guns upon some part of an object whose distance is known.

The advantages of these arrangements are not very obvious, excepting in cases where the position of the enemy may be visible from one part of a ship and not from all the guns in the batteries. Even in these cases, however it requires that all the guns which are to fire in this manner should be regulated by one gun, and all be fired at the same time, which it would be difficult to accomplish; and, if successful, the simultaneous discharge from many heavy guns may be considered objectionable.

Concentration of fire upon a particular part of an enemy's vessel may be obtained by a general order for the guns to be aimed to strike that part, leaving the Captains of guns to determine the proper time for firing, according to circumstances at the moment. This obviates the objections due to simultaneous firing, and would generally be equally effective. In this, as in all other cases at sea, success would depend mainly upon the skill, judgment, and coolness of the Captains of the guns.

THE USE OF FUZES.

284. All spherical shells, except the 24 and 12 pdr. howitzer and all shrapnel, are fitted with the "navy time fuze."

This fuze is composed of a composition driven in a paper case, and then inserted in a metal stock, which screws into a bouching fitted to the shell.

The composition is covered with a "safety cap," which protects it from moisture and accidental ignition; also with a *water cap* of peculiar construction, intended to protect the flame from being extinguished on ricochet.

A "safety plug" at the lower extremity prevents the communication of fire to the powder in the shell in the event of the accidental ignition of the fuze after being uncapped.

285. It is strictly forbidden to show to, or explain, to foreigners or others the construction of any fuzes, except so far as may be necessary for the service of the guns.

286. These fuzes are of $3\frac{1}{2}$, 5, 7, 10, 15, and 20 seconds time of burning; which is supposed to offer a sufficient variety for most of the exigencies of service. There are also supplied paper-case fuzes of greater length.

All shells are fitted and issued from the shell-houses, with the 5" fuze, which is to be regarded as the general working fuze.

For greater or less distance this fuze may be drawn, and any of the others substituted.

The navy time fuze is rarely extinguished by several ricochets on water ; and near the end of its flight, when fired direct, frequently acts by concussion.

The fuze used should not be of longer time of burning than requisite to reach the object ; the shorter time are of quicker composition, therefore more certain ; also in firing on ricochet the shell may sink short of the distance necessary for its explosion, and consequently supposed to fail.

287. For special firing, as, for example, at masses of uncovered troops, any of these fuzes may be shortened. To do this, unscrew the water cap, and back the paper case out from the lower end with a drift and mallet ; cut off from the lower end with a fine saw, or sharp knife struck with a mallet, the proportional part required, and insert the upper part in the stock, forcing it down with a few gentle blows with the drift ; screw on the water cap.

288. The Borman fuze is fitted to the 24-pdr. and 12-pdr. howitzer ammunition, and all shrapnel. It has also been fitted to certain shells used for special firing. The length of fuze is the limit of the distance within which this fire is effective.

This fuze is cut, or rather opened, at the required number of seconds, cutting close to the right of the mark on the index plate. The cut should be made down to the plane of the table, in order to expose the composition, and is best made at two or three efforts instead of trying to effect the cut at once. This fuze should be

carefully explained, as shells have been taken from guns with the cut made into the priming magazine, which would explode them at the muzzle.

289. There are also on trial for the rifled cannon the "percussion" and "time" fuzes of Shenkle, Hotchkiss, Parrott, and others.

290. These fuzes will be exhibited and explained by the Ordnance Officer on the application of Commanders of vessels, who, with the Executive Officer and Gunner, are enjoined to make themselves thoroughly acquainted with this most important part of their equipment.

291. Commanders of vessels will carefully note and report the efficiency of all fuzes fired in action or exercise; giving the elevation of the gun, the estimated or measured range, the number fired, the name of the inventor, whether "percussion" or "time," the number of failures to explode the shell, premature explosions, and satisfactory action. Great waste of ammunition is frequently occasioned by an under-estimate of the distance.

292. The times of flight and length of fuze for all projectiles, so far as ascertained at the Experimental Battery at Washington, are given in the table, pages 160-165,

293. The best effect of a percussion fuze is obtained by firing into a mass of timber. They frequently fail if fired into a bank of soft earth, or other material which does not offer a sufficiently sudden resistance; also if fired at high angles of elevation, owing to the

fact that the shells do not generally strike point foremost.

294. Time fuzes are also very unreliable in rifle guns, owing to the fact that the expanding class of projectiles cut off the flame from the fuze.

CHAPTER IV.

MISCELLANEOUS OPERATIONS.

Getting in Guns on Covered Decks.

295. After bracing the yard over the port through which it is intended to take the guns, secure the lizard round the yard, five or six feet outside of the ship, and hook the top burtons just outside of the lizard.

Haul taut and bring an equal strain on the burtons and lifts. Hook a rolling tackle on the opposite side of the yard, bowse it well taut, and the trusses also, if they be of rope. Pass the end of the pendant of the gun purchase through the thimble of the lizard; take the end up and make it fast round the top-mast, just above the lower cap. Have the port lined with pine boards, to keep it from being chafed.

Bore a hole in the deck or decks through which it is intended to pass the gurnet, as nearly as possible over the rear-end of the gun carriage, and as near in line with the centre of the port into which the guns are to come as the beams will allow. Pass the upper end of the gurnet through the whole, and turn in the thimble, to which hook the pendant tackle. Place a tackle across

the deck ready for bowsing the gun into its carriage through the port.

Bring the gun under the yard and sling it as follows: place one bight of the slings under the neck of the cascabel, and pass the lashing which is attached to the slings round the chase, at such a distance from the trunnions as will allow them to go into the trunnion holes without bringing too great a pressure of the slings against the upper port sill. Then toggle or hook the gun-purchase to the outer bight of the slings and sway away. When the breech of the gun is above the port sill, hook the gurnet and the thwart-ship tackle to the cascabel, and bowse on both. When the slings bear hard on the upper port sill, lower the gun-purchase, and bowse on the gurnet until the breech is high enough for the trunnions to clear the cap-square bolts in the carriage; then bowse on the thwart-ship tackle until the trunnions are over the trunnion holes, lowering the purchase as required to bring the gun into its place.

As each gun is mounted unhook the purchase and gurnet, take off the slings, run the carriage to its proper port, and place another for the next gun.

Taking in Guns over All.

296. Sling the gun slightly breech-heavy, to render it more manageable. If it is to be mounted on the spar deck, place the carriage in the gangway; if on the main deck, close to the main hatchway on that deck. In place of the gurnet, hook the stay-purchase for lowering the gun into its carriage.

Getting out Guns through Ports.

297. Secure the yard as in getting in guns, and sling the gun in the same manner. Hook the gurnet and haul it taut, so as to raise the breech of the gun as much as the port sill will permit; hook or toggle the gun-purchase and sway away. As soon as the trunnions are clear of the carriage haul it from under the gun, ease away the gurnet, and let the gun go out the port. As soon as the gun is perpendicular to the purchase, unhook the gurnet and lower the gun into the lighter, or on the wharf, as the case may be.

If the gun is to be taken out *over all*, the stay-tackle is to be substituted for the gurnet, only it is to be hooked to the same end of the slings as the gun-purchase, and the lashing on the slings is to be passed around the chase of the gun, as near the trunnions as possible, without being in the way of the brackets.

Manner of Using the Griolet Purchase for Dismounting or Mounting Guns on Covered Decks.

298. The gun is to be run in, in the direction required to bring the muzzle under the housing bolt, and the breech under the hole bored in the deck to receive the screw bolt of the upper block of the breech-purchase. This hole should be bored through the plank in the deck, as nearly abreast the middle of the port as the beams will allow, giving the block room to play clear of the beams and carlings.

With a gun's crew of twelve men the operation may be performed as follows :

the word, "Stand by to dismount!" the Quarter Gunner of the division on the deck above that in which the gun is to be dismounted removes the screw tap, and stands ready to place the washer, key and unkey the bolt of the breech-purchase block.

All the numbers, except 1, 2, 3, and 4, man the train-tackle.

No. 1 gives the word "*Run in!*"

While the gun is coming in, Nos. 1 and 2 remove breeching from jaws of cascabel, and 7 and 8 remove it from side shackle. Nos. 1 and 2 throw its bight over the reinforce. No. 1 removes *sight-bar* and screws up the *thumb-screw firmly*.

When the gun is in position—Nos. 1 and 2 adjust upper and lower block of breech-purchase and secure the latter with the cascabel pin. Nos. 3 and 4 chock fore trucks, provide muzzle-purchase, and, assisted, if necessary, by 5 and 6, adjust its upper block. Nos. 5 and 6 unshackle breeching from ship's side, and shove toggle block of muzzle-purchase into the bore and back it to the breech-purchase.

Nos. 7 and 8 unkey and throw back cap squares and choke luffs of side-tackles, or, if rolling deeply, hitch them round the straps of the blocks.

Nos. 9 and 10 provide breech-purchase and assist 1 and 2 in adjusting it.

No. 11 chokes luff of train-tackle, or hitches it, if re-

quired; provides and hooks tackle of muzzle-purchase; belays and lowers.

No. 12 provides and hooks tackle of breech-purchase; belays and lowers.

These preparations made, all the numbers man the breech-tackle fall, or divide themselves to bowse upon both falls together, as the position of the gun in the battery may render either mode most convenient.

At the word "Dismount!" the gun is swayed out of the carriage.

Nos. 3 and 4 attend chocking quoins, and 11 attends train-tackle, if required.

All the numbers, except 11 and 12, who attend purchase falls, move up to their ordinary stations for serving the gun, unhook side-tackles, and remove the old carriage, under the direction of No. 1; and—

At the word "Mount!" the same men bring the new carriage into position for mounting.

At the word "Lower!" Nos. 11 and 12 lower the gun into its place; all the numbers then proceed, respectively, to reverse what they had done in dismounting.

Guns on covered decks may also be dismounted by means of a muzzle lashing, the runner, and the train-tackles, assisted by the handspikes.

The gun is run in and laid square under the housing bolt, the bed and quoin removed, the muzzle elevated and secured as in the housing position; then, after unkeying and throwing back the cap squares, the breech is bowsed up clear of the carriage by means of the train-

tackle, hooked in the eye of a runner, the block of which hooks in an eye-bolt in the beam over the gun. If preferred, this mode of dismounting may be adopted by substituting the muzzle lashing for the toggle block of the griolet, and toggling the runner block in the hole made in the deck for the breech-purchase of the griolet.

Throwing Guns Overboard.

299. The gun's crew being assembled at quarters, remove the pin and chock from the cascabel, into the jaws of which place a selvagee strap; hook the double block of the train-tackle into the housing bolt over the port, and its single block into the selvagee strap; remove the cap squares, and place a round block of wood on the sill of the port, high enough to let the chase bear on it when slightly depressed; raise the breech as much as possible, without lifting the gun out of the carriage. When all is ready man the train-tackle well; have the Handspikemen also ready to assist in raising the breech; and if the vessel is not rolling, it will be well to have additional handspikes under the rear of the carriage to lift it also, so as to give free egress to the gun. When all is ready give the order: "All together—launch!" In a gale of wind advantage should be taken of a favorable roll to give the word, that the action of the sea and of the men at the guns may be simultaneous.

If the guns are to be thrown overboard for the purpose of lightening a ship which is aground, they must be buoyed, and care is to be taken that each buoy-rope is

of a proper length and strong enough to weigh the gun. The best mode of securing the buoy-rope to the gun is to form a clinch or splice an eye in the end which goes over the cascabel, and take a half-hitch with the bight around the chase of the gun, and stop it with spun yarn.

The buoy must be sufficient to float the rope when saturated ; or, in deep water, a smaller line may be used for the buoy, and attached to the rope intended for weighing the gun, that it may be hauled up when wanted.

CHAPTER V.

RIFLED CANNON.

300. The rifled cannon at present in service are—
Parrott.

| Denomination. | Weight. | Charge. | Weight of shell. | Weight of shot. |
|--------------------------|-------------|----------------|------------------|-----------------|
| | <i>lbs.</i> | | | |
| 8-inch, or 150-pounder. | 16,500 | 16 lbs. No. 7 | 135 lbs. | 135 to 154 lbs. |
| 6.4-inch, or 100-pounder | 9,700 | 10 lbs. No. 7 | 80 to 100 lbs. | 70 to 100 lbs. |
| 5.8-inch, or 60-pounder | 4,900 | 8 lbs. No. 7 | 50 lbs. | 60 lbs. |
| 4.2-inch, or 30-pounder | 3,550 | 8½ lbs. cannon | 29 lbs. | 80 lbs. |
| 3.67-inch, or 20-pounder | 1,750 | 2 lbs. cannon | 18 lbs. | 20 lbs. |

Dahlgren.

| Denomination. | Weight. | Charge. | Weight of shell. | Charge. |
|---|-------------|---------------|------------------|----------|
| | <i>lbs.</i> | | | |
| 4-in., or 20-pounder, bronze howitzer | 1,340 | 2 lbs. cannon | 18 lbs. | 0.86 lb. |
| 3.4-in., or 12-pounder, bronze howitzer | 880 | 1 lb. cannon | 11 lbs. | 0.50 lb. |

301. Charges for Parrott's Shell.

| | X-in. | VIII-in. | 100-pdr. | 60-pdr. | 30-pdr. | 30-pdr. |
|------------|-------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | | <i>lbs. oz.</i> | <i>lbs. oz.</i> | <i>lbs. oz.</i> | <i>lbs. oz.</i> | <i>lbs. oz.</i> |
| Long..... | | 10.18 | 5.5 | 8.4 | 1.3 | 1. |
| Short..... | | 4.18 | 8.11 | 2.2 | ..... | ..... |

302. Shell and Shot Gauges.

| | X-in. | VIII-in. | 100-pdr. | 60-pdr. | 30-pdr. | 20-pdr. |
|---------------|-------|----------|----------|---------|---------|---------|
| Greatest..... | 9.95 | 7.95 | 6.86 | 5.27 | 4.17 | 3.64 |
| True diameter | 9.94 | 7.94 | 6.85 | 5.26 | 4.15 | 3.63 |
| Least..... | 9.92 | 7.92 | 6.83 | 5.24 | 4.14 | 3.61 |

303. In the rifle guns of Mr. Parrott it is intended to retain the full charge of powder which a smooth-bore gun of the same calibre would have with a round shot. The projectile for the rifled gun is to be usually ten times the weight of this charge.

To obtain greater initial velocity, projectiles of less than the full weight have been provided—solid shot of 70 pounds for the 100-pounder, and 135 for the 150-pounder, with the front end "*chilled*." Such projectiles, though not suited for long ranges, will be effective at 1,000 yards or less, and are well calculated to act against oblique surfaces of iron.

304. For the 100-pounder gun the initial velocities have been determined as follows :

| Charge. | Projectile. | Initial velocity. |
|--------------------------|------------------------|-------------------|
| 0 lbs. No. 7 powder..... | Shell, 100 pounds. | 1,250 feet. |
| 0 lbs. No. 7 powder..... | Shell, 80 pounds. | 1,380 feet. |
| 1 lbs. No. 7 powder..... | Shell, 80 pounds. | 1,405 feet. |
| 0 lbs. No. 7 powder..... | 82-pounder round shot. | 1,829 feet. |

305. The powder for the 8-inch, 100-pounder and 60-pounder, should be of No. 7 :—for the smaller calibres, 30-pounder and 20-pounder, of navy cannon powder. The cartridge bags are the same as are prescribed for similar calibres of smooth-bore guns.

306. The Parrott guns have been arranged for the use of a certain kind of projectile, supplied by the inventor. These have reference not only to the calibre and mode of rifling, but to the design of the gun itself. For these reasons the inventor objects to the use of any other than his own form of projectile in the guns of his invention. This request has been acceded to. The shells of Shenkle and Hotchkiss have also been used.

It is not considered expedient to describe these projectiles, and it is therefore directed that the Commander, Executive Officer, and Gunner shall make themselves thoroughly acquainted with their construction, and the percussion and time-fuzes issued with them, before sailing, the Ordnance Officer furnishing them with any information on these subjects in his possession.

307. The projectiles consist of shells, shrapnel, and solid shot. All rifled projectiles used in the navy are of the expanding class ; that is, forced into the grooves by the action of the charge of powder, they require no other precautions in loading than common spherical shells.

308. It is, however, essential—

1st. That the base of every rifle projectile, especially the Parrott, shall be thickly greased before entering into

the gun.* For this purpose common pork slush, prepared by several washings in hot water, may be used.

2d. That the bores of all guns shall be frequently washed, the grooves of rifled guns cleaned of *all* residuum and dirt, and a *moist sponge invariably used*. After firing the bore should be oiled with a sponge.

The attention of commanding officers is especially called to this requirement; and the bureau desires that the action of Parrott's and other rifle projectiles fired under the above conditions, may be carefully observed and reported; for it is believed that nearly all the failures in actual service result from the grooves being filled, after a few rounds, with a hardened residuum of powder.

309. It is also necessary that the shell shall be close "home" on the powder, otherwise the necessary expansion will not take place, and the shell will tumble immediately after leaving the gun, utterly destroying its range and accuracy.

310. If, however, a considerable interval should be left between the charge and the projectile, the strain upon the gun would be greatly increased and it possibly burst. For these reasons the rammer handle should be marked to verify this important fact in case of any accident to the gun.

311. It is very important that dirt, sand, or other foreign substances should not be carried into the gun on

* The Shenkle, Hotchkiss, and some other projectiles have a small quantity of grease attached.

the sponge or the projectile, or by the wind, in batteries on shore.

In using guns on shore a canvass muzzle bag or a soft wad, or tight stopper of wood, suggest themselves as a means of security during the interval between loading and firing the gun. The cover or stopper might be removed, or left to be blown away at each discharge.

The longer the interval above alluded to, and the higher the elevation at which the gun is kept, the more important will be the precautions here recommended.*

312. Much care is taken to give the projectiles uniformity of size, and if the powder is of suitable quality, those now supplied will almost invariably take the grooves. Should difficulty in this respect, however, be experienced from any cause, it may be remedied by separating the brass ring from the iron at three or four points of the circumference. This should be done with a cold chisel, very slightly, and not so as to interfere with the loading. It is only necessary to sever the contact of the two metals.

313. It should be observed that the projectile slides in the gun with very little friction, particularly when greased. The gun should therefore be elevated and eased out when firing to leeward, that the shot may not be started from its seat. An experiment to test this, showed that running a 100-pounder out with the force

* Mr. Parrott has furnished articles 811, 819, 821, 828; also the details relative to his guns.

of its crew against the forward heurter, the gun being level, started the shot forward nearly two feet. If the gun were fired with the shot in this position, it would probably burst.

314. The 100-pounder and 150-pounder guns being, respectively, of the calibres of the 32-pounder and 64-pounder, spherical shot, and fired with the same charges, these shot may be fired from them with excellent effect, particularly on ricochet. The round shot should be sewed up in canvass, strapped to a sabot, or snaked between two gromet wads.

315. Both percussion and time fuzes are supplied for these guns. When the object to be fired at presents a sufficient resistance, such as masses of timber or earth, ships, or solidly-built houses, the percussion fuzes alone should be used from rifled cannon. They will, however, frequently fail to explode the shell at long ranges, owing to the shell not striking on its apex; or, if fired into loose earth, which checks its momentum too slowly to allow the plunger to strike with sufficient force.

316. It has been observed that "time" fuzes burn with greater rapidity in shell thrown from rifled cannon. Being in front, they are subjected to greater pressure from the air. A similar effect is produced when the fuze is confined under a water-cap, as in the naval time fuze. Hitherto no reliable time fuze has been arranged for rifled cannon.

317. The fuze holes of the heavy shells are cast larger than the diameter of the regular fuze stocks of

the navy, which can, however, be used with the aid of a bushing ring, always sent with the shells.

318. If it be desired to explode the shell in front of or in the midst of a body of troops, or after having penetrated some resisting obstacle, the time fuze should be used. This is the only fuze to be used with shrapnel.

319. *The Vent* is made in a bouching of pure copper screwed into the gun. In the largest calibres the interior orifice is lined with platinum.

The upper portion of the copper in naval guns is replaced by steel to obtain a harder surface for receiving the blow of the hammer. The steel is three-fourths ($\frac{3}{4}$) of an inch thick.

A new vent can be readily put in after getting out the old one without injury to the screw thread. This can be done by boring out the bouching with a drill, which leaves a thin shell containing the thread. Into the hole thus made insert a square mandril about four inches, driving it lightly; by wrenching it, a portion of the shell of the bouching can be detached and removed by *unscrewing*. This may be repeated, and the whole of the old copper removed. The screw thread is then to be cleaned out, and the new vent plug screwed in.

320. *Sights.*—These consist of a fixed sight upon the right rim base, and a brass movable sight placed in a socket, which is screwed into the rear of the reinforce at the breech of the gun. The movable sight is furnished with a sliding eye-piece, and is graduated up to ten degrees. The eye-piece is also capable of lateral adjust-

ment, to allow for the drift up to ten degrees, and for the effect of the wind. It is desirable that the sights should be placed on both sides of the breech; otherwise, in firing from a port at extreme train, there is a considerable loss of lateral aim. Furthermore, with the sight on the right aim base, it is not convenient for the 2d captain to attend the screw without interfering with the aim.

321. These guns are all rifled to the right, by which it is understood that the upper surface of the projectile is made to turn from left to right, the observer looking from the breech towards the muzzle of the gun.

322. *Drift.*—This is a deviation caused by the direction of the rifling, and is always *to the right* when uninfluenced by the wind, and is always to be allowed for.

323. The *drift* is in practice confounded with the *deviation* produced by the direction and force of the wind, which may either annul or double it, according to whether it blows from right or left across the line of fire. At long range it is also necessary to consider the motion of the vessel across the line of fire. Suppose the vessel was moving at the rate of six knots, and the gun elevated to fifteen degrees, the time of flight would be by the tables, eighteen seconds, and the deviation arising from this cause would be upwards of sixty yards. It is therefore of great importance that the captain of the gun shall be carefully instructed in making this adjustment of the eye-piece.

324. *Elevating screw.*—To obtain readily the changes of elevation necessary in the use of rifled cannon, the

heavier calibres are made with very small preponderance, and are supplied with an elevating screw, which is attached to the carriage at the lower end, while the nut is connected with the cascabel of the gun. Both screw and nut admit of movements by which the screw can take any position required in the various degrees of elevation. The parts should be allowed a certain amount of "*play*;" if binding is prevented, it is believed that the evident advantages of the screw may always be obtained.

325. *Ranges and time of flight.*—So far as ascertained, are contained in Table VII.

326. *Exterior dimensions of boxes containing Parrott's projectiles.*

| | Long. | Wide. | High. |
|-----------------------------------|----------------|----------------|----------------|
| | <i>Inches.</i> | <i>Inches.</i> | <i>Inches.</i> |
| VIII-inch.....1.. | 25 | 10 | 10 |
| 160-pounder, long and short...1.. | 21½ & 18½ | 8½ | 8½ |
| 60-pounder.....10.. | 25½ | 11 | 15½ |
| 80-pounder, containing.....10.. | 25½ | 10½ | 18 |

327. *Hotchkiss' projectile for 20-pounder and 12-pounder howitzer.*

| | | | |
|---------------------------------|----|----|----|
| 20-pounder, containing.....5.. | 24 | 12 | 6½ |
| 12-pounder, containing.....10.. | 20 | 9 | 9 |

328. *Shenkle's projectile for 20-pounder and 12-pounder howitzer.*

| | | | |
|---------------------------------|-----|----|-----|
| 20-pounder, containing.....5.. | 24 | 14 | 7 |
| 12-pounder, containing.....10.. | 22½ | 9½ | 11½ |

329. *J. A. D. projectile for 20-pounder and 12-pounder howitzer.*

| | | | |
|--------------------------------|----|-----|---|
| 20-pounder, containing.....8.. | 15 | 12½ | 7 |
| 12-pounder, containing.....5.. | 19 | 10½ | 6 |

GRADUATION OF SIGHTS AND MEAN RANGES

OF

UNITED STATES NAVAL GUNS.

(From Results of Practice, by Admiral DAHLGREN,
United States Navy.)

I.

The graduation commences from the bottom of the head of the bar resting on the sight-box.

The aim is supposed to be taken at the water-line of a ship.

| | | 32-POUNDER OF 27 CWT. | | 32-POUNDER OF 33 CWT. | |
|--|--------|---------------------------|---------------------------|-----------------------|-------------|
| Charge..... | | 4 lbs. | | 4½ lbs. | |
| Axis of bore above } load line..... } | | 7 feet. | | 7½ feet. | |
| Distance between } sights..... } | | Old model. 29½ inches. | New model. 26½ inches. | 81 inches. | |
| Elevation. | Range. | Graduation. | Graduation. | Range. | Graduation. |
| Degrees. | Yards. | Inches. | Inches. | Yards. | Inches. |
| Level. | 250 | 0.358 | 0.324 | 287 | 0.350 |
| 1° | 545 | 0.746 | 0.684 | 581 | 0.792 |
| 2° | 800 | 1.266 | 1.161 | 857 | 1.348 |
| 3° | 1,047 | 1.801 | 1.652 | 1,140 | 1.909 |
| 4° | 1,278 | 2.337 | 2.144 | 1,398 | 2.478 |
| 5° | 1,469 | 2.870 | 2.633 | 1,598 | 3.044 |
| 6° | 1,637 | 3.393 | 3.116 | ..... | ..... |

II.

| | | 32-POUNDER OF 42 CWT. | | 32-POUNDER OF 57 CWT. | |
|--------------------------------------|--------|----------------------------|----------------------------|-----------------------|-------------|
| Charge..... | | 6 lbs. | | 9 lbs. | |
| Axis of bore above load line..... | | 7½ feet. | | 8 feet. | |
| Distance between sights..... | | Old model. 40.5 inches. | New model. 87.1 inches. | 42.5 inches. | |
| Elevation. | Range. | Graduation. | Graduation. | Range. | Graduation. |
| Degrees. | Yards. | Inches. | Inches. | Yards. | Inches. |
| Level. | 818 | 0.416 | 0.408 | 860 | 0.412 |
| 1° | 672 | 1.016 | 0.981 | 760 | 1.042 |
| 2° | 988 | 1.742 | 1.596 | 1,150 | 1.808 |
| 3° | 1,274 | 2.488 | 2.280 | 1,440 | 2.597 |
| 4° | 1,505 | 3.235 | 2.964 | 1,710 | 3.384 |
| 5° | 1,756 | 3.974 | 3.641 | 1,980 | 4.162 |
| 6° | ..... | ..... | ..... | 2,140 | 4.930 |

III.

| 8-INCH OF 55 CWT. | | | 8-INCH OF 63 CWT. | | |
|--------------------------------------|--------|-------------|---|-------------|-------------|
| Charge..... | | | 9 lbs. | | |
| Shell..... | | | 51½ lbs. | | |
| Axis of bore above load line..... | | | 8 feet. | | |
| Distance betw'n sights. 37 inches. | | | { Old model. New model. 48.50 inches. 38.20 inches. | | |
| Elevation. | Range. | Graduation. | Range. | Graduation. | Graduation. |
| Degrees. | Yards. | Inches. | Yards. | Inches. | Inches. |
| Level. | 288 | 0.429 | 330 | 0.460 | 0.402 |
| 1° | 579 | 0.949 | 660 | 1.100 | 0.964 |
| 2° | 869 | 1.608 | 970 | 1.878 | 1.647 |
| 3° | 1,148 | 2.280 | 1,260 | 2.678 | 2.350 |
| 4° | 1,418 | 2.958 | 1,540 | 3.478 | 3.051 |
| 5° | 1,657 | 3.682 | 1,770 | 4.278 | 3.749 |
| 6° | 1,866 | 4.300 | ..... | ..... | ..... |

IV.

| | IX-INCH SHELL GUN. | | XI-INCH SHELL GUN. | | XI-INCH SHELL GUN. | |
|---|-----------------------|------------------|-----------------------------|------------------|---------------------------------------|------------------|
| Charge..... | 10 lbs. | | 15 lbs. | | 15 lbs. | |
| Shell..... | 72 lbs. | | 185 lbs. | | 135 lbs. | |
| Axis of bore above load line..... } | 10 feet. | | 10 feet. [Screw sloops.] | | 20 feet. [2d deck above water.] | |
| Distance be- tween sights } | 89 inches. | | 48 inches. | | 48 inches. | |
| Elevation. | Range. | Gradua- tion. | Range. | Gradua- tion. | Range. | Gradua- tion. |
| Degrees. | Yards. | Inches. | Yards. | Inches. | Yards. | Inches. |
| Level. | 340 | 0.461 | 306 | 0.600 | 420 | 0.87 |
| ..... | 700 | 0.988 | 500 | 0.945 | 700 | 1.48 |
| ..... | 900 | 1.514 | 700 | 1.442 | 900 | 2.01 |
| ..... | 1,100 | 2.073 | 900 | 2.040 | 1,100 | 2.62 |
| ..... | 1,300 | 2.646 | 1,100 | 2.651 | 1,300 | 3.25 |
| ..... | 1,500 | 3.222 | 1,300 | 3.225 | 1,500 | 4.92 |
| ..... | 1,700 | 3.818 | 1,500 | 3.958 | ..... | ..... |
| ..... | ..... | ..... | 1,700 | 4.681 | ..... | ..... |

V.—APPROXIMATE RANGES

| Class of gun. | Kind of projectile. | Weight of projectile. | Charge, lbs. | Height above plane. | ELEVATION IN DEGREES. | | | | |
|------------------------|---------------------|-----------------------|--------------|---------------------|-----------------------|------|------|-------|-------|
| | | | | | P. B. or 0° | 1° | 2° | 3° | 4° |
| XV-inch.. | Cored shot | 400 | .... | .... | .... | .... | .... | .... | .... |
| | Shell..... | 350 | 85 | .... | 800 | 620 | 920 | 1,200 | 1,470 |
| | | | | | | | 1.9 | 3.7 | 4.3 |
| XI-inch.. | Shell..... | 186 | 15 | 10 | 806 | 631 | 918 | 1,208 | 1,472 |
| | | | | | .84 | 1.72 | 2.8 | 3.88 | 4.9 |
| | Shell..... | 186 | 15 | 20 | 421 | 679 | 992 | 1,257 | 1,524 |
| X-inch... | Shell..... | 136 | 20 | 10 | 1.16 | 1.96 | 3 | 3.94 | 4.99 |
| | | | | | | | | | |
| | Shrapnel.. | 141 | 15 | 10 | 295 | 620 | 910 | 1,200 | 1,465 |
| IX-inch... | Shell..... | 108 | 12½ | 11 | .8 | 1.7 | 2.7 | 3.7 | 4.7 |
| | | | | | 840 | 705 | 970 | 1,230 | 1,490 |
| | | | | | | 2 | 2.9 | 3.9 | 4.9 |
| VIII-inch.. | Shrapnel.. | 101 | .... | .... | .... | .... | .... | .... | .... |
| | Shell..... | 72½ | 10 | 10½ | 832 | 718 | 962 | 1,218 | 1,471 |
| | | | | | .9 | 1.96 | 3 | 4 | 5.1 |
| IX-inch... | Shell..... | .... | 18 | .... | .... | .... | .... | .... | .... |
| | Shrapnel.. | 75 | 10 | .... | 832 | 718 | 960 | 1,215 | 1,470 |
| | | | | | .8 | 1.9 | 2.9 | 4 | 5 |
| VIII-in., 68-cwt... | Shell..... | 51½ | 9 | 8 | 830 | 660 | 970 | 1,260 | 1,540 |
| | | | | | | 1.89 | 3.07 | 4.34 | 5.32 |
| | Shrapnel.. | 52 | .... | .... | 840 | 670 | 980 | 1,270 | 1,550 |
| VIII-in., 55-cwt... | Shell..... | 51½ | 7 | 7½ | .9 | 1.8 | 3 | 4.2 | 5.2 |
| | | | | | 283 | 579 | 869 | 1,148 | 1,413 |
| | Shrapnel.. | 52 | .... | .... |  | 1.7 | 2.9 | | |
| | | | | | 290 | 590 | 880 | 1,160 | 1,420 |
| | | | | | .8 | 1.6 | 2.8 | 3.9 | 4.9 |

OF SHELL GUNS.

—RANGES IN YARDS.—TIME OF FLIGHT IN SECONDS.

[illegible]

VI.—APPROXIMATE RANGES OF

| Class of gun. | Kind of projectile. | W't of projectile. | Charge. | Height above plane. | ELEVATION IN DEGREES. | | | | |
|-------------------------|---------------------|--------------------|---------|---------------------|-----------------------|-----|-------|-------|-------|
| | | | | | P. B. or 0° | 1° | 2° | 3° | 4° |
| 32-pounder of 57 cwt. | Shot..... | 32 | 9 | 8 | 360 | 760 | 1,150 | 1,440 | 1,710 |
| | Shell..... | 26 | 6 | .... | .... | 2.2 | 3.4 | 4.8 | 5.3 |
| | Shrapnel... | 32 | .... | .... | .... | 800 | 1,100 | 1,350 | 1,570 |
| 32-pounder of 42 cwt. | Shot..... | 32 | 6 | 8½ | 360 | 760 | 1,150 | 1,440 | 1,710 |
| | Shell..... | 26 | 6 | .... | .... | 2.2 | 3.4 | 4.8 | 5.3 |
| | Shrapnel... | 32 | .... | .... | .... | 800 | 1,020 | 1,300 | 1,500 |
| 32-pounder of 33 cwt. | Shot..... | 32 | 4½ | 7½ | 313 | 672 | 988 | 1,274 | 1,505 |
| | Shell..... | 26 | 4½ | 15½ | 330 | 700 | 1,020 | 1,300 | 1,500 |
| | Shrapnel... | 32 | .... | .... | .... | .7 | 1.8 | 2.9 | 4.2 |
| 32-pounder of 27 cwt. | Shot..... | 32 | 4 | 7 | 313 | 672 | 988 | 1,274 | 1,505 |
| | Shell..... | 26 | .... | .... | .... | .8 | 1.8 | 2.8 | 3.8 |
| | Shrapnel... | 32 | .... | .... | .... | 257 | 581 | 857 | 1,140 |
| 24-pounder howitzer. | Shot..... | 32 | 4½ | 7½ | 366 | 655 | 929 | 1,152 | 1,385 |
| | Shell..... | 26 | 4½ | 7½ | 293 | 661 | 952 | 1,218 | 1,416 |
| | Shrapnel... | 32 | 4½ | 7½ | 297 | 581 | 857 | 1,140 | 1,398 |
| 12-pdr. heavy howitzer. | Shot..... | 32 | 4 | 7 | 250 | 545 | 800 | 1,047 | 1,278 |
| | Shell..... | 26 | .... | .... | .... | .7 | 1.4 | 2.6 | 3.7 |
| | Shrapnel... | 32 | .... | .... | .... | 250 | 545 | 800 | 1,047 |
| 12-pdr. light howitzer. | Shot..... | 32 | .... | .... | .... | .7 | 1.4 | 2.6 | 3.7 |
| | Shell..... | 20 | 2 | .... | .... | 541 | 760 | 960 | 1,140 |
| | Shrapnel... | 26 | .... | .... | .... | 2. | 2.9 | 3.8 | 4.8 |
| 12-pdr. heavy howitzer. | Shot..... | 32 | .... | .... | .... | 540 | 760 | 960 | 1,140 |
| | Shell..... | 10 | 1 | .... | .... | 1.8 | 2.9 | 4. | 5. |
| | Shrapnel... | 13 | .... | .... | .... | 516 | 715 | 875 | 995 |
| 12-pdr. light howitzer. | Shot..... | 32 | .... | .... | .... | 1.9 | 2.8 | 3.6 | 4.3 |
| | Shell..... | 9 | .... | .... | .... | 498 | 680 | 845 | 1,000 |
| | Shrapnel... | 12 | 625 | .... | .... | 1.8 | 2.6 | 3.7 | 4.4 |

SHOT GUNS AND HOWITZERS.

— RANGES IN YARDS. — TIME OF FLIGHT IN SECONDS.

[illegible]

VII.—APPROPRIATE RANGES

| Class of gun. | Kind of projectile. | Weight of Projectile. | Charge, lbs. | Height above plane. | ELEVATION IN | | | |
|-------------------------------------|---------------------|-----------------------|--------------|---------------------|-----------------|-----------|-----------|-------------|
| | | | | | P, B, or 0°. | 1° | 2° | 3° |
| Parrot — 8-inch, or 150 pdr..... | Solid shot.... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Hollow shot.... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Long shell.. | 155 | 16 | ..... | ..... | ..... | ..... | ..... |
| | Short shell.. | ..... | No. 7 | ..... | ..... | ..... | ..... | ..... |
| Parrot—100 pdr. | Solid shot.... | 99½ | 10 | ..... | ..... | ..... | ..... | ..... |
| | Hollow shot.... | 80 | 10 | ..... | ..... | ..... | ..... | ..... |
| | Long shell.. | 100 | 10 | ..... | ..... | ..... | ..... | 1,400 4½ |
| | Short shell.. | 80 | 10 | ..... | ..... | ..... | ..... | ..... |
| Parrot—60 pdr.. | Shrapnel.... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Shot..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Shell ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Shrapnel.... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Parrot—30 pdr.. | Shot..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Shell | 29 | Can. 8½ | ..... | ..... | ..... | ..... | ..... |
| | Shrapnel.... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | Shot..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Parrot—20 pdr.. | Shell..... | 18½ | Can. 2 | ..... | ..... | ..... | ..... | ..... |
| | Shrapnel.... | 19½ | Can. 2 | ..... | ..... | 620 1½ | 950 3½ | ..... |
| | Shot..... | ..... | Can. 2 | ..... | ..... | ..... | ..... | ..... |
| | Shell | 20 | 2 | ..... | ..... | ..... | ..... | 1,230 |
| Dahlgren—20 pdr..... | Shrapnel.... | ..... | 2 | ..... | ..... | ..... | ..... | ..... |
| | Shot..... | ..... | Can. 1 | ..... | ..... | ..... | ..... | ..... |
| | Shell | 12 | 1 | ..... | ..... | ..... | ..... | ..... |
| | Shrapnel.... | ..... | 1 | ..... | ..... | ..... | ..... | ..... |

DEGREES—RANGES IN YARDS—TIME OF FLIGHT IN SECONDS.

| 8½° | 8¾° | 4° | 5° | 10° | 15° | 20° | 25° | 30° | 35° |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | | | | | | | | |
| | | | 2,100 | | | | | | |
| | | | 6½ | | | | | | |
| | | | | | | | | | |
| | | | 2,200 | 3,810 | 5,080 | 6,125 | 6,910 | | |
| | | | 6½ | 18 | 18½ | 22½ | 29 | | |
| | | | | | 5,190 | 6,883 | 7,180 | 7,988 | 8,458 |
| | | | | | 19 | 28 | 29½ | 82½ | 86½ |
| 1,450 | | 1,700 | 2,150 | 3,700 | 4,790 | 5,353 | 6,320 | | |
| 4½ | | 5½ | 6½ | 13 | 18 | 21½ | 28 | | |
| | | | | | | | | 7,310 | |
| | | | | | | | | 82½ | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 1,500 | | | 2,200 | 3,500 | 4,800 | 5,700 | 6,700 | | |
| 4½ | | | 6½ | 12½ | 17½ | 21½ | 27 | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | 1,500 | | 2,100 | 3,350 | 4,400 | | | | |
| | 4½ | | 6½ | 11½ | 17½ | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | 1,750 | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | 1,400 | | | | | | | |
| | | 5 | | | | | | | |

VIII.

*Table for Finding the (Distance of an Object at Sea.)**

To use the table, let an observer from the cross-trees, measure the angle between the distant horizon and the enemy's water line, and look into the table with that angle; opposite to it, in the column marked distances, will be found the distance of the object in yards.

| Yards. | Height of the eye above the level of the sea, in feet. | | | | | | | | | |
|-----------|--|------|------|------|-------|-------|-------|-------|-------|---|
| Distance. | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | |
| | ° / | ° / | ° / | ° / | ° / | ° / | ° / | ° / | ° / | ° |
| 100 | 3.44 | 5.37 | 7.29 | 9.21 | 11.11 | 13.00 | 14.47 | 16.34 | 18.16 | |
| 200 | 1.50 | 2.46 | 3.43 | 4.39 | 5.35 | 6.31 | 7.27 | 8.23 | 9.18 | |
| 300 | 1.12 | 1.49 | 2.26 | 3.04 | 3.41 | 4.19 | 4.56 | 5.33 | 6.11 | |
| 400 | .52 | 1.21 | 1.48 | 2.16 | 2.44 | 3.12 | 3.40 | 4.08 | 4.36 | |
| 500 | .41 | 1.03 | 1.25 | 1.48 | 2.10 | 2.32 | 2.54 | 3.17 | 3.39 | |
| 600 | .34 | .52 | 1.10 | 1.29 | 1.47 | 2.05 | 2.24 | 2.42 | 3.01 | |
| 700 | .28 | .44 | 1.01 | 1.15 | 1.31 | 1.46 | 2.01 | 2.18 | 2.34 | |
| 800 | .24 | .38 | .51 | 1.05 | 1.18 | 1.32 | 1.46 | 2.00 | 2.13 | |
| 900 | .21 | .33 | .45 | .57 | 1.09 | 1.22 | 1.33 | 1.45 | 1.57 | |
| 1000 | .18 | .29 | .40 | .50 | 1.01 | 1.12 | 1.23 | 1.34 | 1.45 | |
| 1100 | .16 | .26 | .35 | .45 | .55 | 1.05 | 1.15 | 1.24 | 1.34 | |
| 1200 | .15 | .23 | .32 | .41 | .50 | .59 | 1.08 | 1.17 | 1.26 | |
| 1300 | .13 | .21 | .29 | .37 | .45 | .53 | 1.02 | 1.10 | 1.18 | |
| 1400 | .12 | .19 | .27 | .34 | .41 | .49 | .57 | 1.04 | 1.12 | |
| 1500 | .11 | .18 | .24 | .31 | .38 | .45 | .52 | .59 | 1.07 | |
| 1600 | .10 | .16 | .22 | .29 | .35 | .42 | .48 | .55 | 1.02 | |
| 1700 | .09 | .15 | .21 | .27 | .33 | .39 | .45 | .51 | .58 | |
| 1800 | .08 | .14 | .19 | .25 | .31 | .36 | .42 | .48 | .54 | |
| 1900 | .08 | .13 | .18 | .23 | .29 | .34 | .39 | .45 | .50 | |
| 2000 | .07 | .12 | .17 | .22 | .27 | .32 | .37 | .42 | .47 | |
| 2100 | .06 | .11 | .16 | .20 | .25 | .30 | .35 | .40 | .45 | |
| 2200 | .06 | .10 | .15 | .19 | .24 | .28 | .33 | .38 | .42 | |
| 2300 | .05 | .10 | .14 | .18 | .22 | .27 | .31 | .36 | .40 | |
| 2400 | .05 | .09 | .13 | .17 | .21 | .25 | .29 | .34 | .38 | |
| 2500 | .05 | .08 | .12 | .16 | .20 | .24 | .28 | .32 | .36 | |

No correct use of this table can be made when the proximity of land may interfere with the distance of the horizon.

* By Lieutenant W. P. Buckner, U. S. N. See a pamphlet "On the Determination of Distances at Sea," by Captain A. P. Ryder, R. N., for more extended tables of this and other methods.

IX.

Angles subtended by the mainmasts of British ships-of-war between the water-line and the truck, and also between the water-line and the topmast cross-trees, at distances expressed in yards, the eye of the observer being placed 20 feet above the level of the water. (See Article 278, page 83.)

| DISTANCES. | SHIPS OF THE LINE. | | | | | | | | FRIGATES. | | | | SLOOPs. | | | | BRIGs. | | | |
|------------|-----------------------|----|---------------------------|----|------------------------------------|----|---------------------------|----|---------------------|----|---------------------------|----|---------------------|----|---------------------------|----|---------------------|----|--------------------------|----|
| | 120 Guns. 3 Decks. | | | | From 92 to 80 Guns. 2 Decks. | | | | 50 Guns. | | 42 Guns. | | 26 Guns. | | 16 Guns. | | | | | |
| | Truck. 208 feet. | | Cross-trees. 132 feet. | | Truck. 198 feet. | | Cross-trees. 144 feet. | | Truck. 176 feet. | | Cross-trees. 125 feet. | | Truck. 168 feet. | | Cross-trees. 120 feet. | | Truck. 121 feet. | | Cross-trees. 85 feet. | |
| | ° | ' | ° | ' | ° | ' | ° | ' | ° | ' | ° | ' | ° | ' | ° | ' | ° | ' | ° | ' |
| 100 | 85 | 53 | 27 | 34 | 34 | 30 | 26 | 16 | 31 | 17 | 23 | 6 | 30 | 4 | 22 | 15 | 22 | 25 | 16 | 2 |
| 200 | 19 | 18 | 14 | 19 | 18 | 26 | 13 | 35 | 16 | 29 | 11 | 50 | 15 | 46 | 11 | 22 | 11 | 28 | 8 | 5 |
| 300 | 13 | 4 | 9 | 37 | 12 | 27 | 9 | 7 | 11 | 6 | 7 | 55 | 10 | 37 | 7 | 37 | 7 | 40 | 5 | 24 |
| 400 | 9 | 52 | 7 | 14 | 9 | 23 | 6 | 51 | 8 | 22 | 5 | 57 | 5 | 43 | 5 | 46 | 4 | 3 | 5 | 57 |
| 500 | 7 | 55 | 5 | 47 | 7 | 32 | 5 | 29 | 6 | 42 | 4 | 46 | 6 | 24 | 4 | 35 | 4 | 37 | 3 | 15 |
| 600 | 6 | 36 | 4 | 50 | 6 | 17 | 4 | 35 | 5 | 35 | 3 | 58 | 5 | 21 | 3 | 49 | 3 | 51 | 2 | 42 |
| 700 | 5 | 40 | 4 | 9 | 5 | 24 | 3 | 56 | 4 | 58 | 3 | 24 | 4 | 35 | 3 | 16 | 3 | 18 | 2 | 19 |
| 800 | 4 | 57 | 3 | 38 | 4 | 43 | 3 | 26 | 4 | 12 | 2 | 59 | 4 | 1 | 2 | 52 | 2 | 53 | 2 | 2 |
| 900 | 4 | 24 | 3 | 13 | 4 | 12 | 3 | 8 | 3 | 44 | 2 | 39 | 3 | 33 | 2 | 33 | 2 | 34 | 1 | 48 |
| 1000 | 3 | 58 | 2 | 54 | 3 | 57 | 2 | 45 | 3 | 22 | 2 | 23 | 3 | 12 | 2 | 17 | 2 | 19 | 1 | 37 |
| 1100 | 3 | 36 | 2 | 38 | 3 | 26 | 2 | 30 | 3 | 3 | 2 | 10 | 2 | 55 | 2 | 5 | 2 | 6 | 1 | 28 |
| 1200 | 3 | 18 | 2 | 25 | 3 | 9 | 2 | 17 | 2 | 48 | 1 | 59 | 2 | 40 | 1 | 55 | 1 | 56 | 1 | 21 |
| 1300 | 3 | 3 | 2 | 14 | 2 | 54 | 2 | 7 | 2 | 35 | 1 | 50 | 2 | 28 | 1 | 46 | 1 | 47 | 1 | 14 |
| 1400 | 2 | 50 | 2 | 4 | 2 | 42 | 1 | 58 | 2 | 24 | 1 | 42 | 2 | 18 | 1 | 38 | 1 | 39 | 1 | 9 |
| 1500 | 2 | 39 | 1 | 56 | 2 | 31 | 1 | 50 | 2 | 15 | 1 | 35 | 2 | 8 | 1 | 32 | 1 | 32 | 1 | 5 |

X.—ANGLES SUBTENDED—

Angles subtended by the mainmasts of French ships-of-war, water line and the topmast cross-trees, at distances exact above the level of the water.

| DISTANCES. | SHIPS OF THE LINE. | | | | | |
|------------|---------------------|---------------------------|---------------------|---------------------------|---------------------|---------------------------|
| | 120 Guns. | | 90 Guns. | | 82 Guns. | |
| | 220 feet. Truck. | 155 feet. Cross-trees. | 201 feet. Truck. | 151 feet. Cross-trees. | 192 feet. Truck. | 138 feet. Cross-trees. |
| | ° / | ° / | ° / | ° / | ° / | ° / |
| Yards. | | | | | | |
| 100 | 87 30 | 28 31 | 84 55 | 27 24 | 83 33 | 24 50 |
| 200 | 20 20 | 14 51 | 18 41 | 14 18 | 17 54 | 18 2 |
| 300 | 13 48 | 9 59 | 12 38 | 9 33 | 12 5 | 8 44 |
| 400 | 10 25 | 7 31 | 9 32 | 7 11 | 9 6 | 6 34 |
| 500 | 8 21 | 6 1 | 7 39 | 5 45 | 7 18 | 5 16 |
| 600 | 6 59 | 5 1 | 6 23 | 4 48 | 6 5 | 4 23 |
| 700 | 5 59 | 4 18 | 5 23 | 4 7 | 5 14 | 3 46 |
| 800 | 5 14 | 3 46 | 4 48 | 3 36 | 4 35 | 3 13 |
| 900 | 4 39 | 3 21 | 4 16 | 3 12 | 4 4 | 2 56 |
| 1000 | 4 11 | 3 1 | 3 56 | 2 53 | 3 40 | 2 33 |
| 1100 | 3 49 | 2 44 | 3 29 | 2 37 | 3 20 | 2 26 |
| 1200 | 3 30 | 2 31 | 3 13 | 2 24 | 3 8 | 2 12 |
| 1300 | 3 14 | 2 19 | 2 57 | 2 18 | 2 49 | 2 2 |
| 1400 | 2 60 | 2 9 | 2 44 | 2 4 | 2 37 | 1 53 |
| 1500 | 2 48 | 2 1 | 2 33 | 1 55 | 2 27 | 1 45 |

FRENCH VESSELS.

between the water-line and the truck, and between the pressed in yards, the eye of the observer being placed 20

| FRIGATES. | | | | CORVETTES. | | BRIGS. | |
|---------------------|---------------------------|---------------------|---------------------------|---------------------|--------------------------|---------------------|--------------------------|
| 60 Guns. | | 44 Guns. | | 24 Guns. | | 18 Guns. | |
| 188 feet. Truck. | 189 feet. Cross-trees. | 168 feet. Truck. | 191 feet. Cross-trees. | 120 feet. Truck. | 85 feet. Cross-trees. | 112 feet. Truck. | 77 feet. Cross-trees. |
| ° / | ° / | ° / | ° / | ° / | ° / | ° / | ° / |
| 28 4 | 25 27 | 30 4 | 22 25 | 22 15 | 16 2 | 20 52 | 14 34 |
| 17 38 | 18 7 | 15 46 | 11 23 | 11 22 | 8 5 | 10 37 | 7 20 |
| 11 51 | 8 48 | 10 37 | 7 40 | 7 37 | 5 24 | 7 6 | 4 54 |
| 8 55 | 6 37 | 7 59 | 5 46 | 5 43 | 4 8 | 5 20 | 3 40 |
| 7 9 | 5 18 | 6 24 | 4 37 | 4 35 | 3 15 | 4 16 | 2 56 |
| 5 58 | 4 25 | 5 21 | 3 51 | 3 49 | 2 42 | 3 34 | 2 27 |
| 5 6 | 3 47 | 4 35 | 3 18 | 3 16 | 2 19 | 3 8 | 2 6 |
| 4 29 | 3 19 | 4 1 | 2 53 | 2 52 | 2 2 | 2 40 | 1 50 |
| 3 59 | 2 57 | 3 33 | 2 34 | 2 33 | 1 43 | 2 28 | 1 33 |
| 3 35 | 2 39 | 3 12 | 2 19 | 2 17 | 1 37 | 2 8 | 1 23 |
| 3 16 | 2 25 | 2 55 | 2 6 | 2 5 | 1 28 | 1 57 | 1 20 |
| 2 59 | 2 13 | 2 40 | 1 56 | 1 55 | 1 21 | 1 47 | 1 14 |
| 2 46 | 2 2 | 2 28 | 1 47 | 1 40 | 1 14 | 1 39 | 1 6 |
| 2 34 | 1 54 | 2 18 | 1 39 | 1 33 | 1 10 | 1 32 | 1 3 |
| 2 24 | 1 46 | 2 8 | 1 32 | 1 32 | 1 5 | 1 26 | 0 59 |

XI.—TANGENT

Tangent practice with 8-inch and 32-pounder guns, with to the axis of the bore. The line supposed to be struck is

| POINTS AIMED AT. | | | |
|---|-----------|---|--|
| Elevation. | Distance. | Height of the parts aimed at above the water. | In a French ship of 82 guns. |
| | | | In a French frigate of 44 guns. |
| 8-INCH GUN OF 63 CWT. 1 shell and 9 lbs. powder. | | | |
| Deg's. | Yards. | Ft. In. | |
| Level. | 830 | 9 0 | At the upper part of Middle of gun deck lower ports—gun ports. |
| 1 | 660 | 48 7 | About half way between water and fore yard. |
| 2 | 970 | 108 6 | 8½ feet below main cap. |
| 3 | 1260 | 207 1 | Fore topmast cross-trees. Above main truck. |
| 8-INCH GUN OF 55 CWT. Charge 7 lbs. 1 shell. | | | |
| Level. | 288 | 7 6 | Middle of lower deck Sills of gun-deck ports. |
| 1 | 579 | 87 10 | 10 feet above hammock rail. About midway between water and fore cap. |

NOTE.—This mode of firing presents serious disadvantages. The the enemy's vessel, the class of which can seldom be accurately to hit, and the chances of the ricochet are lost; hence tangent firing lating the elevation of the guns. The spars of English ships are rather

PRACTICE.

the charge for distant firing. The line of sight is parallel in the water-line.

| | | | | |
|--------|-------|-------|--|------------------------------------|
| 2 | 689 | 79 8 | Main top. | A little below main cap. |
| 3 | 1148 | 188 0 | Just below main truck. | Above main truck. |
| | | | 82-POUNDER OF 57 CWT. | |
| | | | <i>Charge 9 lbs. 1 shot.</i> | |
| Level. | 360 | 9 0 | At upper part of lower deck ports. | Middle of gun-deck ports. |
| 1 | 760 | 48 9 | About midway between main cap and water. | Just under fore yard. |
| 2 | 1150 | 129 6 | 8 feet above fore topmast cross-trees. | Main topmast cap. |
| 3 | ..... | ..... | Above main truck. | |
| | | | 82-POUNDER OF 27 CWT. | |
| | | | <i>Charge 4 lbs. 1 shot.</i> | |
| Level. | 250 | 7 0 | Middle of lower deck ports. | Sills of gun-deck ports. |
| 1 | 545 | 35 6 | About 10 feet above hammock rail. | Midway between water and main top. |
| 2 | 800 | 90 9 | Main cap. | 6 feet above main cap. |
| 3 | 1047 | 171 6 | Head of main top-gallant rigging. | Main truck. |

points aimed at have often to be estimated, as well as the distance of determined; the men are taught to aim where they are not expected should only be resorted to when there are no other means of regulation than those of French ships of the same class.



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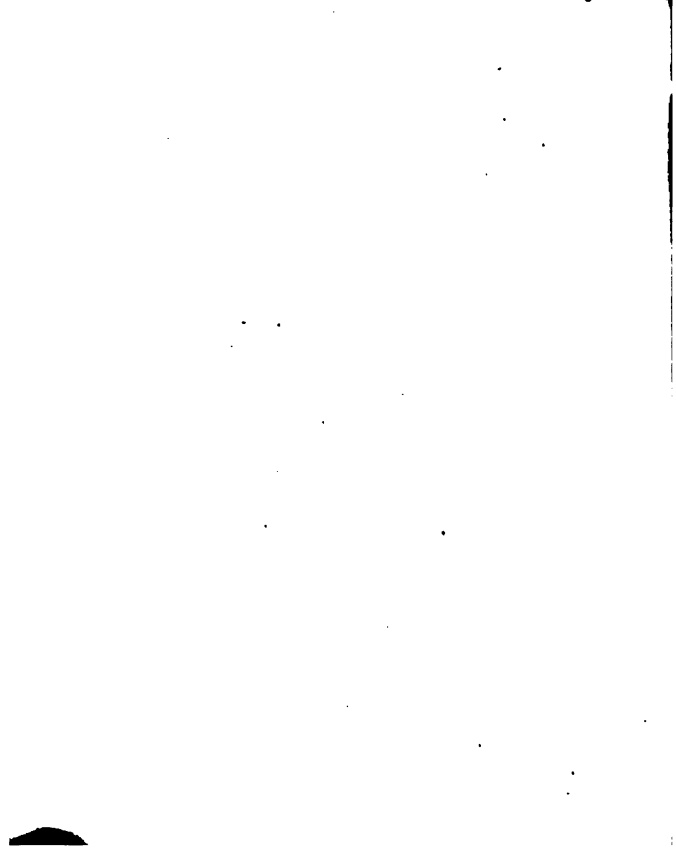
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Marsilly Carriage for IX-Inch Shell Gun.

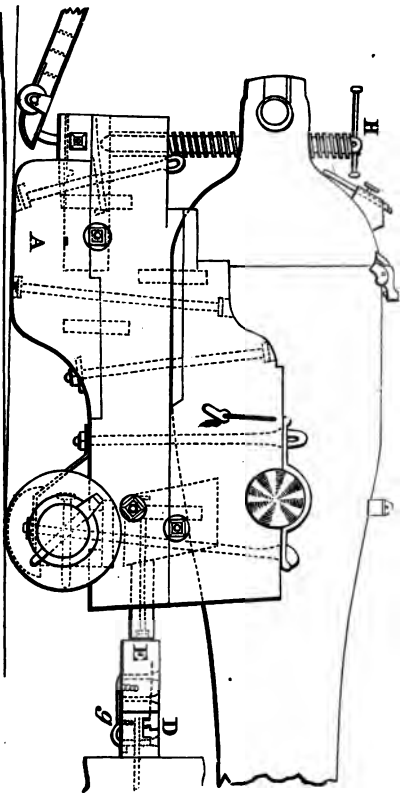
NOMENCLATURE OF PARTS.

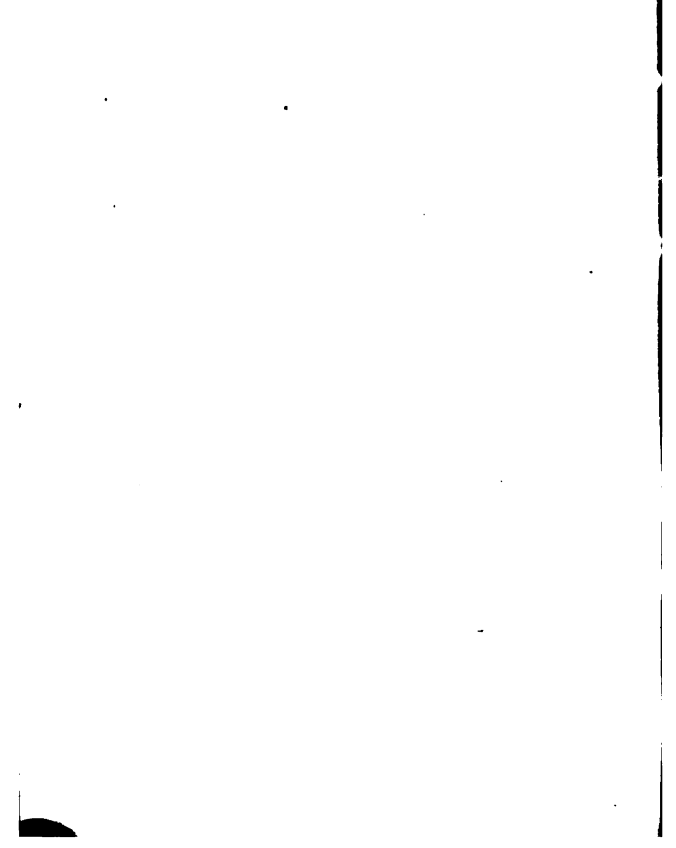
- A.** *The lowest piece of the Bracket, in place of rear truck of ordinary Carriage.*
- B.** *Rear Transom, in place of rear axle.*
- C.** *Breast-piece.*
- D. E.** *Sweep-pieces fixed.*
- D.** *Fixed below the Port-sill.*
- E.** *Movable, with brass catches (f. f.) and hooks and eyes (g. g.)*
- H.** *Elevating screw and lever, with saucer (I), in place of bed and quoin.*
- K.** *Roller Handspike.*
- L.** *Loop for Handspike.*



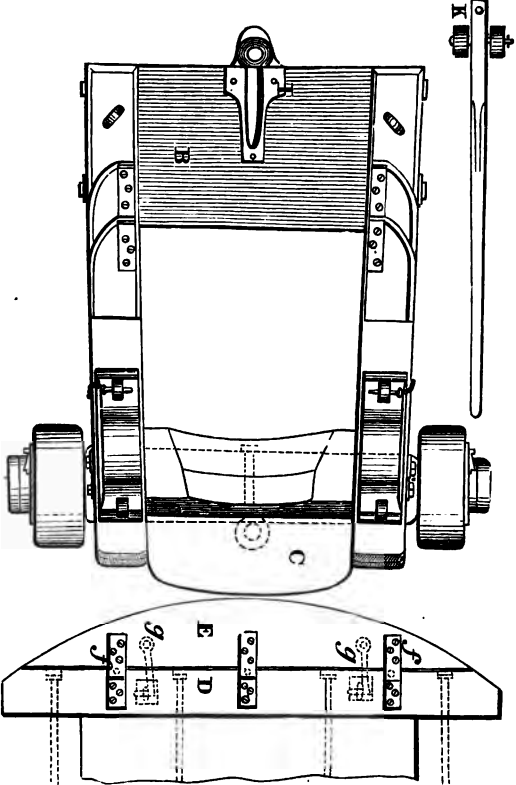
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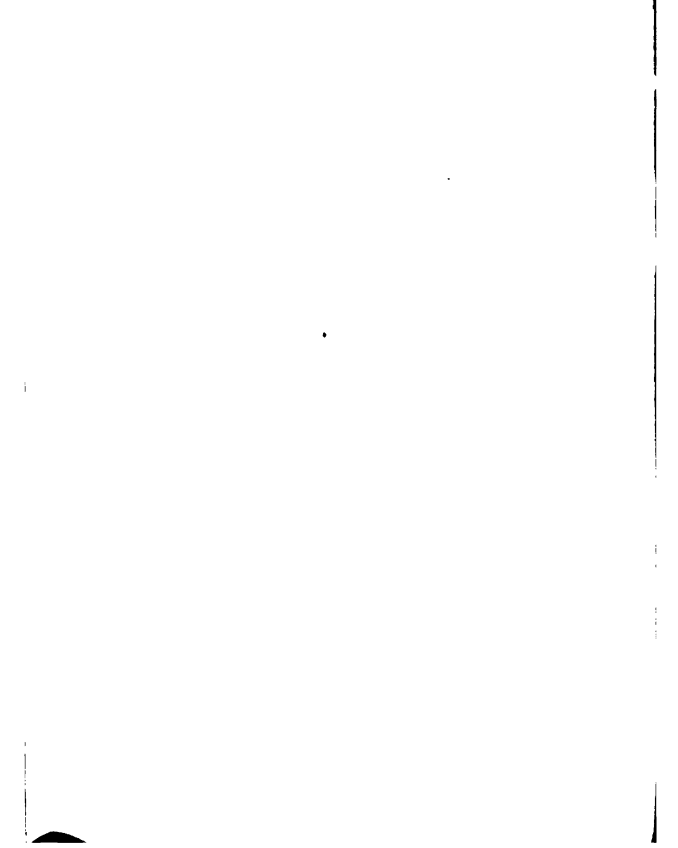
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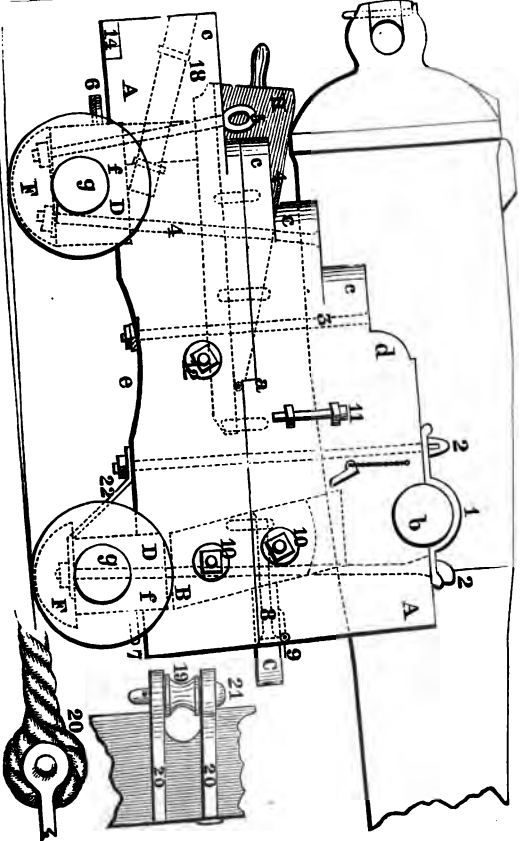


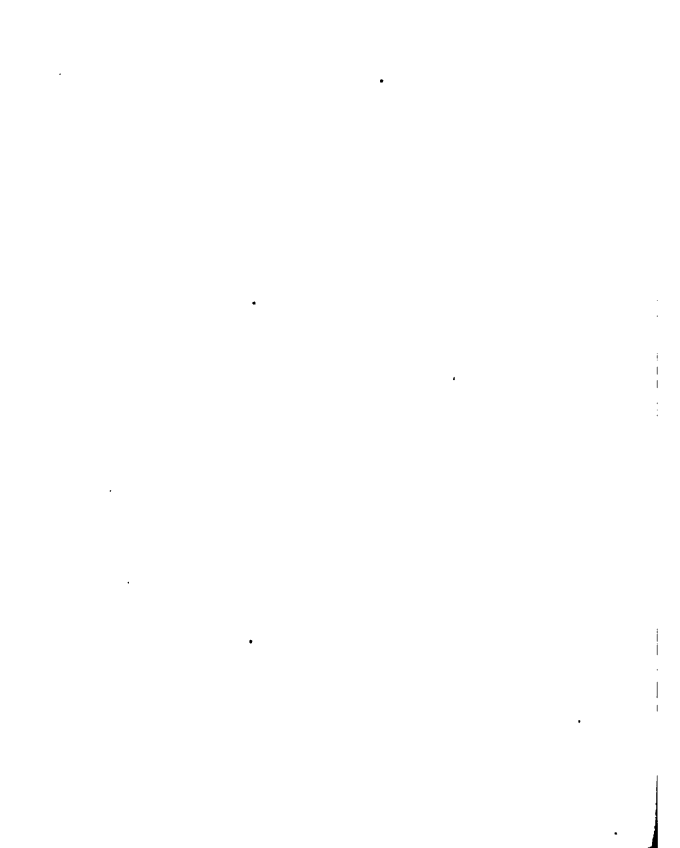
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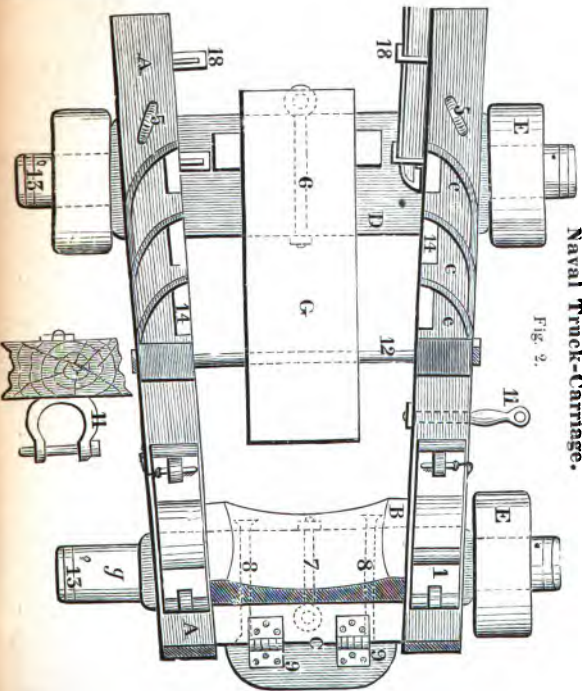
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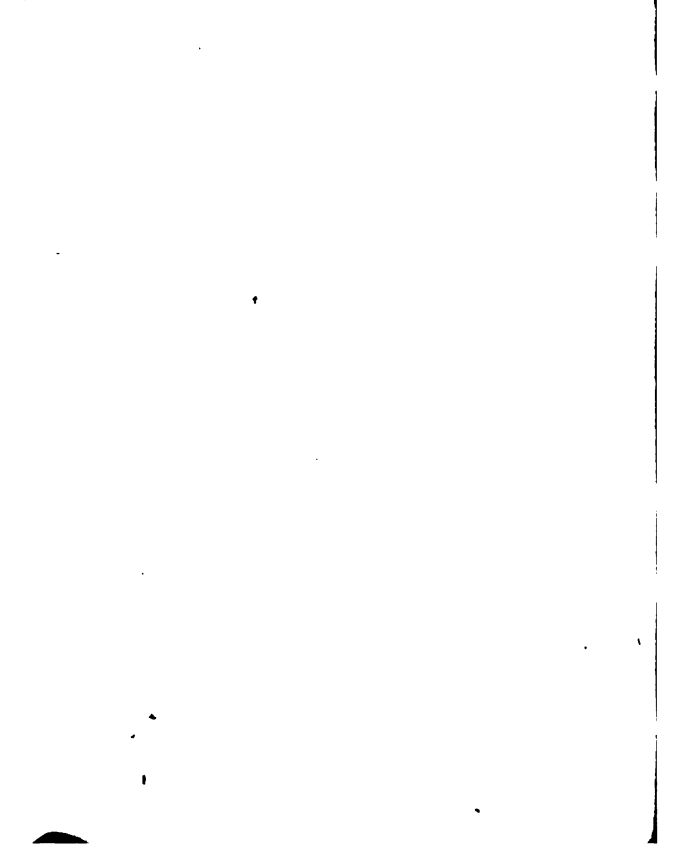




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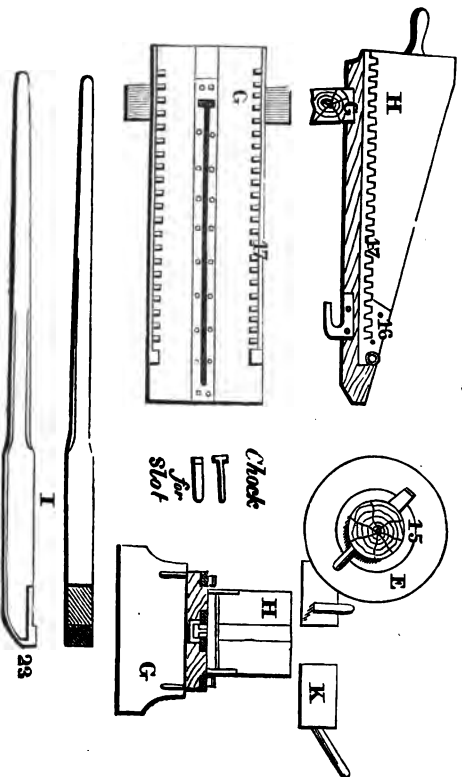
Fig. 2.

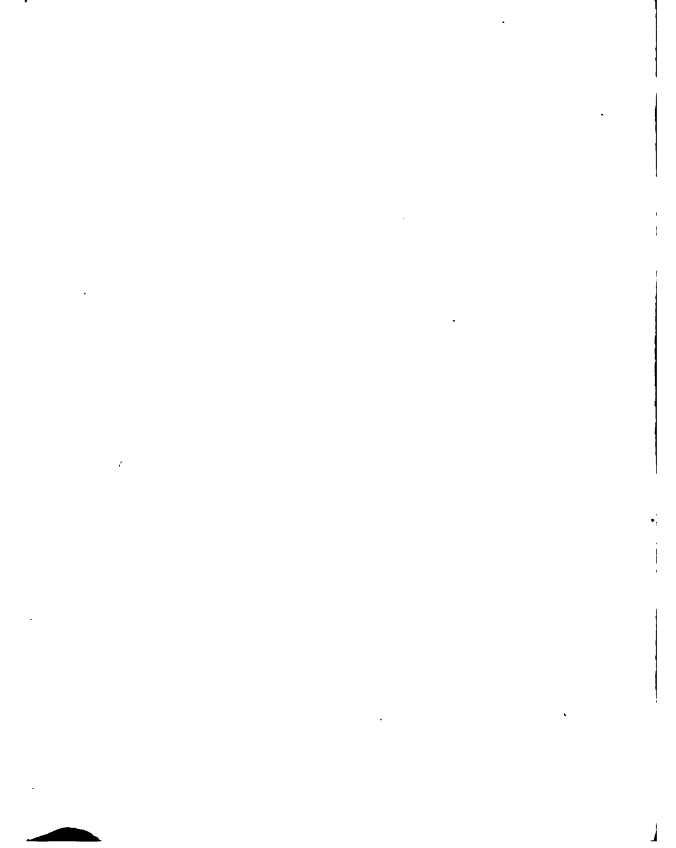




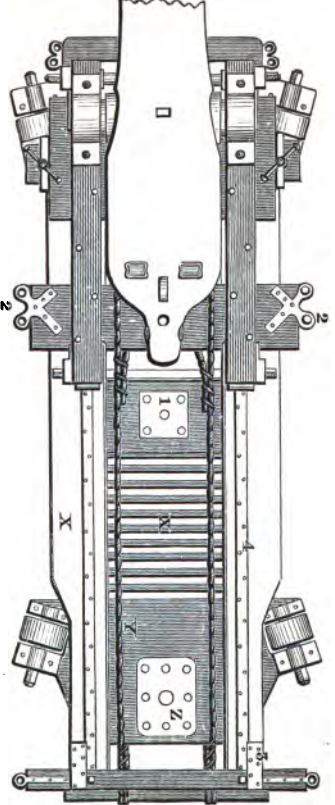
Naval Truck-Carriage.

Fig. 8.





Plan of XI-Inch Gun-Carriage and Slide.



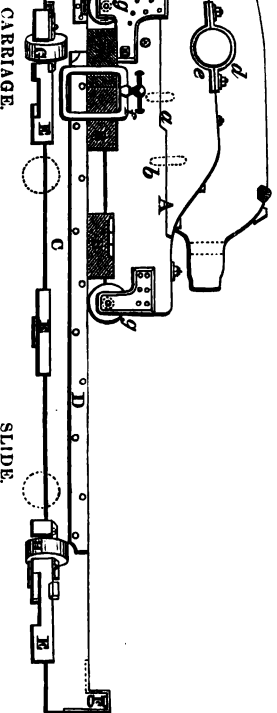
WOODEN PARTS.

- X.** *Buttens and Slide.*
- Y.** *Preventer Breeching.*

METAL PARTS.

- Z.** *Upper Pivot-plate.*
- 1.** *Middle Roller-plate.*
- 2.** *Eyes for Tackles.*
- 3.** *Hurter Straps.*
- 4.** *Rail Plates.*

Side Elevation of XI-Inch Gun-Carriage and Slide.



CARRIAGE.

SLIDE.

WOODEN PARTS.

METAL PARTS.

WOODEN PARTS.

METAL PARTS.

- A. Brackets of two pieces, with jog (a.) and dovela (b.).
- B. Transoms, (projecting beyond the rails, front, middle, and rear, jogged into brackets.
- d. Cap squares
- e. Trunnion plates.
- f. Compressor, with screw and lever.
- g. Rollers and journal plates.
- C. Rails.
- D. Compressor battens.
- E. Transoms, front and rear, each in two parts, middle in one part.
- F. Hurters, front and rear.
- G. Shifting trucks.
- H. Trunnion trucks, both with journals and eccentric axles.



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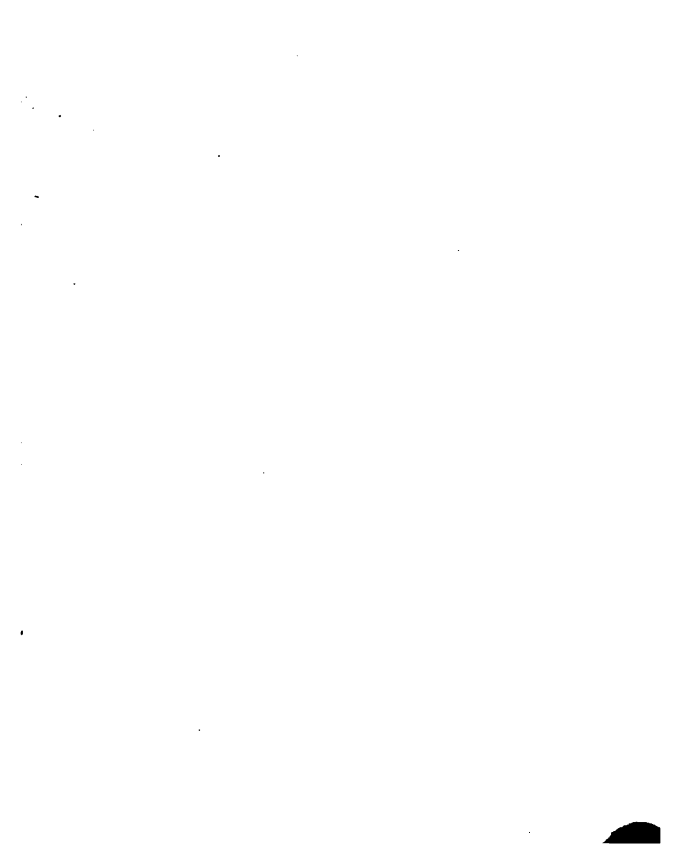
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